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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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Manual Skill and Intelligence.—II

The point raised in our first article on this question comes up from some work on the nature of manual skill recently carried out by the Institute of Industrial Psychology and discussed in a recent lecture by Dr. J. W. Cox. Some tests were made on elementary school boys and girls, older students and on teachers and other educated people. The results of the tests in each of the groups were in agreement. The tests were simple manual operations like threading a turnbuckle, assembling an electric lampholder, etc. Intelligence tests were taken at the beginning and the results were known. Now it was found that the agreement between general intelligence and ability to carry out manual operations was comparatively small. There was some measure of agreement, but other factors were present. Of these, two were broadly recognised. One was the ability to recognise a sequence of mechanical motions, and the other was the ability to control muscular movement. In manual operations, proficiency at one simple operation did not mean proficiency at another; some people were able to do one thing better than the others they were called on to do. The effect of experience was interesting. On the first day at a job, the candidates were placed in a certain order of proficiency. After a fortnight's practice and experience, they gained much in proficiency, but finished up in about the same relative order. In other words, practice enables output to be improved, but it does not repair the gap between a poor worker and a good one.

A still more important point emerges here. If people were left to practice by themselves, they were not able to improve at new operations. If, however, they were trained to do a job, shown exactly what to do and how to do it, they not only did better at the job than others who merely practised for themselves, but they did better at new operations and did them more rapidly. In other words, training is much better than practice because its effects carry over to other jobs. Yet an instructor must not merely ask a student to imitate him, but he must show the student what are the exact requirements for the best performance of the operation. Could carefully devised training have higher praise? Anyone who has compared the results of an hour's practice driving a golf ball for the first time with a lesson from the professional will appreciate the point. But industry lacks its professionals able and willing to devote their whole time and energy to training.

International Business

The Board of Trade returns for August, whilst providing no cause for alarm, give much food for thought. At a first glance, one notices that the quantity and value of the pig-iron imports have increased by nearly 25 per cent. to a total of £246,342, but, when examined in detail, it is found that foundry pig-iron has actually decreased from 26,000 to 21,000 tons, the lower amount being returned at a lower price. A large proportion of this importation of foundry pig-iron comes from within the Empire and has to be regarded as British.

Under the general heading of "Castings and forgings," the increase in imports is somewhat striking, as the value has advanced from £16,400 to £69,079 for the first eight months of this year. For cast pipes and fittings, the increase has been from £18,049 to 42,100, but as a weight decrease from 894 to 764 tons has taken place, it is obvious that the nature of the material has changed. Stoves and grates imports have also registered an increase from £38,801 to £62,804, a figure which tallies reasonably well with a weight increase of 420 to 770 tons. The bath situation is also interesting, as in this case the value has increased from £92,497 to £129,202, but here again an international agreement dominates the situation.

On the export side, the pig-iron industry has this year (eight months) increased its sales to £264,268 as against £223,480 for the corresponding period of last year. The foundries making cast-iron pipe have also done considerably better in the export market, having increased their turnover from £497,134 to £638,747. The same conditions have been experienced by the light-castings industry, as considerable gains have been registered in both stoves and grates, and in sanitary cisterns, the former having risen from £201,427 to £266,764, and the latter from £48,085 to £57,770. The case of hollow-ware is apparently unsatisfactory, as imports have increased from £63,115 to £92,875, and exports for cast hollow-ware decreased from £107,260 to £87,868.

The recent changes in the make-up of the Board of Trade returns are an improvement with regard to the cast-iron pipe trade, but less satisfactory as regards the detailing of the actual exports and imports of iron and steel castings. However, we never attached too much importance to the old classification, as we were

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aware of serious imports of steel castings which were evidently entering British ports under some other classification. The more interest foundrymen take in the statistics relating to their industry the better will they be served by the Board of Trade. The figures we have quoted are of real interest, as they show clearly the trading tendencies of a protected home industry.

Institute of British Foundrymen

ELECTION OF NEW MEMBERS

At a General Council Meeting of the Institute of British Foundrymen, held at the Victoria Street Congregational Schools, Blackpool, on Saturday, September 22, 1934, the following were elected to various grades of membership.

As Members.

D. E. Catton, steelfounder, Catton & Company, Hunslet; P. C. Fassotte, engineer, 1, Place du Champ de Mars, Brussels; N. L. Goodchild, pig-iron sales representative, Stanton Ironworks Company, London, W.C.; E. R. Millac, engineer, Foundry Equipment, Limited; Dr. Ing. H. A. Nipper, lecturer, Technical High School, Aachen.

As Associate Members.

E. D. Brown, foundry engineer, Austin Motor Company, Longbridge; G. L. Harbach, metallurgical chemist, Worthington, Simpson, Limited, Newark; J. Kerfoot, foundry foreman, Messenger & Company, Loughborough; P. D. Pincott, foundry supervisor, Peter Brotherhoods, Limited; J. Robertson, patternmaker, Wright, Boag & Company, Johannesburg; R. W. Rowe, foundry foreman, Ideal Boilers & Radiators, Limited; H. R. E. Slater, demonstrator (practical foundryman), Foundry Equipment, Limited, London; W. Bulloch, Jnr., patternmaker, Cruikshank & Company, Denny; J. S. Ferguson, patternmaker, Yarrow & Company, Scotstoun; R. Hogg, foreman patternmaker, Bo'ness Iron Company, Limited; A. Walker, chemist, Renton & Fisher, Bathgate.

As Associate.

C. Chetwood, moulder, The Horsehay Company, Wellington.

Atomic Arrangement in Alloys

In a Paper on "Atomic Arrangement in Alloys," read by MR. A. J. BRADLEY at the Aberdeen meeting of the British Association, the author pointed out that the application of X-ray analysis to the study of alloys had yielded a great amount of fresh information impossible to be obtained by the older methods of metallography. The problem of differentiating between alloy phases and of determining phase boundaries had become much simpler, while in many instances X-ray work had shown the presence of phases difficult to identify by other methods. Each phase had a characteristic structure which in its salient features was the same for all alloys belonging to the phase, but a more detailed study showed that there were continuous structural changes on varying either composition or temperature. Detailed changes in atomic arrangement, *e.g.*, the formation of superlattices, might be followed quantitatively by means of X-ray intensity measurements. The results of all such investigations fitted in with the data obtained from measurements of magnetism, electrical conductivity and other physical properties.

A NEW SALES OFFICE for Scotland will be opened at 200, St. Vincent Street, Glasgow, C.2, on Monday, October 1, by Messrs. George Ellison, Limited, Perry Bar, Birmingham. A showroom has been fitted out to display the latest Ellison drawout distribution switchgear.

District Presidents.—No. 5

BIRMINGHAM BRANCH OF THE INSTITUTE OF BRITISH FOUNDRYMEN

Mr. George Talbot Lunt, President of the Birmingham Branch, was educated at King Edward's Grammar School, Stourbridge, and has obtained certificates in metallurgy under City and Guilds and Board of Education Examinations. He commenced work in the cost accounting and purchasing departments of the Earl of Dudley's Round Oak Works, Limited, Brierley Hill, under the late Mr. J. W. Trowsdale, and, in 1912, was appointed chief purchasing officer.

In 1923, he severed his connection with the Round Oak Works to take up a position as secretary and commercial manager to Messrs.

MR. G. T. LUNT.

Bradley & Foster, Limited, Darlaston Blast Furnaces, Darlaston, Staffs, then undergoing financial reconstruction.

Mr. Lunt has for several years acted as managing director of Messrs. Bradley & Foster, Limited, and, in addition, is managing director of Bradley's (Concrete), Limited, Darlaston, and a director of Birchley Rolling Mills, Limited, Oldbury. He also has interests in the wagon building and repairing trades. He is a member of various societies, including the Iron and Steel Institute, the Staffordshire Iron & Steel Institute and the British Cast Iron Research Association.

Structure of Ferro-Silicon

H. DELOMÉNIE ("Chimie et Industrie") has studied the structure of pure and commercial ferro-silicons containing 45 to 65 per cent. Si. Alloys containing less than 51 per cent. Si were found hard and resistant, with from 51 to 55 per cent. Si crystalline and above 55 per cent. Si of a grey colour. All were attacked by hydrochloric acid, hydrofluoric acid and alcoholic KOH. Pure alloys contained the FeSi more finely dispersed than the commercial samples, according to metallographic examination. Alloys with 50 to 54 per cent. Si were a eutectic of FeSi and $FeSi_2$ and were not subject to spontaneous ignition owing to the absence of arsenic and phosphorus. Above 54 per cent. Si. crystals of this element were found. Commercial ferro-silicon decomposed in moist air owing to the presence of an Al-P compound, and this did not occur except when both elements were present.

Random Shots

In the course of his rambles through English literature, both light and heavy, Marksman has been struck by the fact that our language, in order to achieve some of its strongest phrases, borrows to a not inconsiderable extent from the ferrous industry. "Hard as iron" and "tough as steel" are two expressions which occur to the mind, but Marksman feels that there are others which the trade may legitimately claim as its own, for are not its ramifications widespread, and its connections flung near and far? We talk of "sledge-hammer blows," and it is safe to say that the reality of the mental image created comes from the iron hammer-head rather than from the wooden shaft. After all, it would not be too effective to say, "He was unable to stand up against these croquet-mallet blows!" Transform the sentence, "The serpent, coiled like a steel spring, lay right in her path," to "There in the pathway was the serpent, curled up like taut elastic," and you realise at once that the writer who sets out to pen a thriller can hardly fail to acknowledge his indebtedness to our trade.

* * *

There are, of course, phrases more homely which nevertheless have their use and play a useful part in rounding off our mother tongue by giving verve and point to a remark. Marksman, although he has always been of abstemious and sober habits, finds "tight as a drum" an extremely apt expression, but whether the drum in question is of the steel variety or the unfailing complement of wind instruments is a matter for debate. What about "crowbar methods"? As a short, sharp summary of style it takes some beating, for it sums up in two words, and very adequately, what might easily be spun out to twenty without achieving such a photographic effect. And who would make a crowbar out of anything except steel? Marksman has no claims to be dubbed "wiry," but there are people built on less generous lines who well deserve this epithet. Here, again, the iron and steel industry may stake its claim, for surely no other metal fits into the picture so well. We talk about "steeling" ourselves to the execution of some difficult undertaking, and the Psalmist has sung to us that the iron has entered into his soul. There was a time, too, when novelists introduced us to "men of iron" (or, if you like, "men of mettle"), who had always "iron-grey hair" and eyes "cold as steel," but these ferrous fellows are known as he-men in this degenerate age!

* * *

As an industry, Marksman feels that we cannot lay claim to a monopoly of high-sounding phrases, for he has a fairly vivid recollection that in the early days of cycling it was no unusual thing for the impudent youth of the country to hail a passing rider in strident tones with "Any old iron?" Was not that enough to make anybody turn up rusty? And there you are again! Nothing rusts like iron. In history we have Cromwell's Ironsides and the Iron Duke, in fiction the "Man in the Iron Mask," and in Germany the "Steel Helmets." How many times in past days have the King's ships nailed their flags to the mast for the greater glory of the British Navy? Surely these nails were made of iron. There would be something "ironical" about it if they were not! Then, of course, there is "blast," essentially an ingredient in the iron and steel pie, for what should we do without our furnaces? "Blast" is one thing when applied to a furnace, but does it not emerge into a fuller and a greater sphere of usefulness when it issues, with heartfelt vigour, from the lips of some unfortunate who has just failed to hit the nail on the head—and found his thumb where the nail ought to have been!

MARKSMAN.

Aluminium Alloy Sand or Die Castings

NEW SPECIFICATIONS

The Air Ministry have just recently issued four specifications, D.T.D. 133B, 238, 243 and 248, dealing with light alloy castings.

D.T.D. 133B

D.T.D. 133B supersedes D.T.D. 133A and covers the alloy generally known as "Hiduminium R.R.50." Amongst the more interesting clauses are:—

D.T.D. 133B (Superseding Specification No. D.T.D. 133A).

(1) *Quality of Material.*—(*a*) The aluminium used for making this alloy shall be in accordance with the latest issue of British Standard Specification No. L.31; (*b*) the copper used for making this alloy shall be of a standard of purity equal to that of electrolytic copper, and (*c*) no scrap shall be used other than that derived from the maker's own manufacture.

(2) *Chemical Composition.*—(*a*) The chemical composition of the castings shall be:—

Copper: not less than 0.8 nor more than 2.0 per cent.
Nickel: not less than 0.8 nor more than 1.75 per cent.
Magnesium: not less than 0.05 nor more than 0.30 per cent.
Iron: not less than 0.8 nor more than 1.40 per cent.
Titanium: not less than 0.05 nor more than 0.25 per cent.
Silicon: not less than 1.5 nor more than 2.80 per cent.
Aluminium: the remainder.

(*b*) Unless otherwise agreed with the Director of Aeronautical Inspection, the complete analysis of the castings shall be supplied to the inspector.

(3) *Heat-Treatment.*—(*a*) Unless otherwise specified in the contract, the castings shall be delivered in the heat-treated condition. (*b*) The castings and test samples shall be heated at a temperature of 155 to 170 deg. C. for 8 to 16 hrs. and cooled normally in air, in an air blast, or in water.

(4) *Dimensions.*—The castings shall be made to the dimensions specified within the limits given in clause 5 and be capable of being machined where required to the finished dimensions without leaving evidence of the cast surface.

(5) *Margins of Manufacture.*—The thickness of castings where not machined shall be not less than the nominal thickness and shall not exceed it by more than 10 per cent.

(6) *Freedom from Defects.*—(*a*) The castings shall be clean, sound and free from blow-holes. They shall be capable of being machined satisfactorily and of taking a good finish; (*b*) any casting may be rejected for faults of manufacture, defects or incorrectness of dimensions whether discovered during inspection or subsequently during machining, notwithstanding that the casting had been previously passed as conforming to the chemical composition and mechanical tests of this specification.

(7) *Provision and Preparation of Test Samples.*—(*a*) At least one test sample shall be cast to represent each large casting. When castings are made from more than one charge and the charges are not mixed prior to casting, a test sample shall be cast from each charge. When small castings are made by taking metal from a larger charge, one test sample shall be cast for every 100 lbs. of metal poured. (*b*) The metal for the test samples shall be taken directly from the same crucible or ladle of metal from which the casting or castings will be poured. The metal so taken shall not be subjected to any treatment other than cooling down to the appropriate pouring temperature. (*c*) The test samples shall be cast in dry-sand moulds of the dimensions shown in Fig. 1. The mould shall be rammed in one piece; it shall be inclined at an angle of 30 deg. from the vertical during pouring and shall be poured from the top. (*Note.*—The temperature

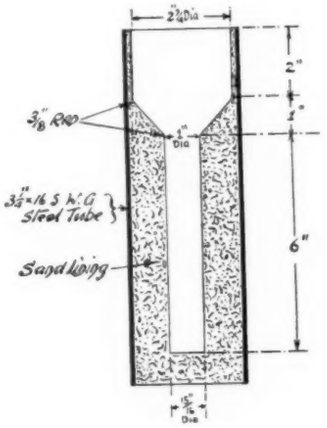

FIG. 1.—MOULD FOR TEST SAMPLES.

of the mould immediately prior to casting should be between 10 deg. C and 40 deg. C.) (*d*) The test samples heat-treated as specified in clause 3 (*b*) shall be machined to the dimensions shown in Fig. 2. The test samples shall not be mechanically worked before they are tested.

(8) *Tensile Tests.*—(*a*) The test-pieces prepared as specified in clause 7, must comply with the following tests, which shall be carried out to the satisfaction of the inspector. The testing appliances shall be such that the load when applied is axial. Should a tensile test-piece break outside the middle half of its gauge length, the test may be discarded and another test made. (*b*) When tested they must give the following results:—Maximum stress not less than 11 tons per sq. in.; elongation not less than 2½ per cent.

(9) *Re-tests.*—If any test-piece fails to meet the requirements of the specification, the inspector may reject the casting, castings or charge represented by that test-piece or at the request

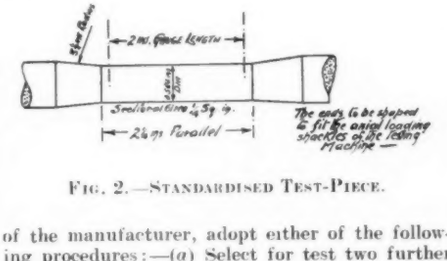
Steel Collar
2" Dia. Gauge Length
Screwed Ends 1.5g in.
2¼" Parallel
The ends to be shaped to fit the grips of the testing machine

FIG. 2.—STANDARDISED TEST-PIECE.

of the manufacturer, adopt either of the following procedures:—(*a*) Select for test two further samples representing the same casting, castings or charge, which have been heat-treated with the casting or castings. Test-pieces prepared from these two further samples must comply with the tensile test specified in clause 8. (*b*) Allow the casting or castings to be re-heat-treated in accordance with clause 3 (*b*) and re-tested in accordance with clauses 7 and 8.

(10) *Identification.*—All castings passed by the inspector shall be stamped with the mark of the inspector and a symbol or such other marking which shall ensure full identification of the material.

D.T.D. 238.

This specification covers the alloy generally known as "Hiduminium R.R.53." The chemical composition is specified at:—

Copper: not less than 1.5 nor more than 2.5 per cent.
Nickel: not less than 0.5 nor more than 2.0 per cent.
Magnesium: not less than 1.4 nor more than 1.8 per cent.
Iron: not less than 1.2 nor more than 1.5 per cent.
Titanium: not less than 0.02 nor more than 0.12 per cent.
Silicon: not more than 2.0 per cent.
Aluminium: the remainder.

This alloy must give not less than 9 tons maximum stress.

D.T.D. 243.

This specification covers the alloy generally known as "Hiduminium R.R.53B." Its chemical composition is:—

Copper: not less than 2.0 nor more than 3.0 per cent.
Nickel: not less than 1.0 nor more than 2.0 per cent.
Magnesium: not less than 0.6 nor more than 1.0 per cent.
Iron: not less than 1.2 nor more than 1.5 per cent.
Silicon: not less than 0.7 nor more than 1.5 per cent.
Impurities (including titanium): not more than 0.3 per cent.

Aluminium: the remainder; whilst the maximum stress must not be less than 18 tons per sq. in. in the heat-treated condition.

D.T.D. 248.

This specification covers the alloy generally known as "Hiduminium R.R.53B," the chemical composition of which is:—

Copper: not less than 2.0 nor more than 3.0 per cent.
Nickel: not less than 1.0 nor more than 2.0 per cent.
Magnesium: not less than 0.6 nor more than 1.0 per cent.
Iron: not less than 1.2 nor more than 1.5 per cent.
Silicon: not less than 0.7 nor more than 1.5 per cent.
Impurities (including titanium): not more than 0.3 per cent.

Aluminium: the remainder; whilst the maximum stress must not be less than 9 tons per sq. in. as cast.

The specifications numbered 133B and 243 are not suitable for pistons, whilst 238 and 248 are designed for this purpose. The clauses in all four specifications are the same except those relating to composition and strength. The specifications are obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 1s. plus postage.

IN THE HALF-YEARLY REPORT of the Ironfounding Workers' Association, the secretary, Mr. Hugh Murdoch, states that trade during the first six months of the year was maintained at a steady level, and from reports to hand the present outlook seems to be good. The hope is expressed that the improvement will continue for some time, and so enable those who are still on the unemployed list to be absorbed into their normal occupation. In the first half of the year the membership of the Association increased, whilst the finances show an increase of £2,123 12s.

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Fifth International Foundry Congress

The following tentative programme, judging from previous occasions, fairly well represents finality in the matter of arrangements for the Philadelphia Congress.

Monday, October 22.

A.M. and P.M.—Registration and Committee Meetings.

12 noon.—Formal Opening of Exhibition.

4 to 5.30 p.m.—Shop Operation Courses (Sand Control and Cupola Practice).

7 p.m.—Annual Alumni Dinner.

Tuesday, October 23.

10 a.m.—SESSION 1.—Formal Opening Meeting—International Foundry Congress.

2.30 p.m.—SESSION 2—NON-FERROUS. (1) "Porosity in Leaded Bronze Bushings," by A. W. Lorenz, Bucyrus-Erie Company, Milwaukee, Wis.; (2) "Effects of Elevated Temperatures on the Strength and Dimensional Stability of Certain Aluminum Alloys Used in Aircraft," by R. R. Kennedy, Wright Field, Dayton, Ohio; (3) "Cupola Melting of Red Brass," by W. C. Alvin, Imperial Brass Manufacturing Company, Chicago, Ill.

2.30 p.m.—SESSION 3—STEEL. (1) "Steel Castings," by Dr. W. H. Hatfield, Brown-Firth Research Laboratories, Sheffield (Exchange Paper, Institute of British Foundrymen); (2) "Controlled Directional Solidification," by Geo. Batty, Steel Castings Development Bureau, Philadelphia, Pa.; (3) "Some Aspects of the Physical Chemistry of Steelmaking," by P. Herasymenko and E. Valenta, Skoda Works Research Institute, Plsen, Czecho-Slovakia (Exchange Paper, Czecho-Slovakian Foundry Association); (4) "Studies on Solidification and Contraction of Steel Castings," II, by C. W. Briggs and R. A. Gezelius, Naval Research Lab., Washington, D.C.

2.30 p.m.—SESSION 4—APPRENTICE TRAINING.

4 to 5.30 p.m.—SESSION 5—SHOP OPERATION COURSE CUPOLA PRACTICE. (1) "Cupola Fore Hearths," by G. S. Evans, Mathieson Alkali Works, New York; (2) "Processed Petroleum Coke," by Clark B. Carpenter, Colorado School of Mines, Golden, Colo.

4 to 5.30 p.m.—Shop Operation Course—Sand Control.

9 p.m.—Reception to Overseas Guests.

Wednesday, October 24.

10 a.m.—SESSION 6—STEEL. *Symposium on Porosity in Steel Castings.* (1) W. C. Woodward, Geo. H. Smith, Steel Castings Company, Milwaukee, Wis.; (2) C. E Sims, American Steel Foundries, East Chicago, Ind.; (3) George Batty, Steel Castings Development Bureau, Philadelphia, Pa.; (4) R. A. Bull, Chicago, Illinois.

10 a.m.—SESSION 7—NON-FERROUS. *Symposium on Deoxidation and Degasification of Non-ferrous Casting Alloys.* (1) Introduction—Discussion of General Principles, Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, O.; (2) "Bronze Foundry Alloys," Committee Report, O. W. Ellis, Ontario Research Foundation, Chairman; (3) "Yellow Brass Casting Alloys," by L. Ward, Chase Brass & Copper Company, Waterbury, Conn.; (4) Aluminum and Its Alloys," by H. J. Rowe, Aluminum Company of America, Cleveland, Ohio.

10 a.m.—SESSION 8—CAST IRON. (1) "Breaking Strength and Physical Properties of Grey Iron," by J. Novarro-Alacer (Spanish Exchange Paper); (2) "Permanent Mould Castings," by Fred Walls, Eaton-Erb Foundry Company, Detroit, Mich.; (3) "Study of the Fluidity of Cast Iron" (Belgian Exchange Paper); (4) "High Chromium Cast Iron," by Garnet Phillips, Frank Foundries, Moline, Ill.

12.30 p.m.—NON-FERROUS Round Table Luncheon.

12.30 p.m.—STEEL CASTINGS Round Table Luncheon.

2.30 p.m.—SESSION 9—REFRACTORIES.

4 to 5.30 p.m.—Shop Operation Courses (Sand Control and Cupola Practice).

7 p.m.—Annual Banquet—Medal Awards.

Thursday, October 25.

10 a.m.—SESSION 10—CAST IRON. (1) "Cupola High Test Cast Iron," by R. P. Lemoine, Paris (Exchange Paper, French Foundry Association); (2) "Polishing Cast Iron for Microscopic Examination," by M. F. Surls, Michigan State College, East Lansing, Michigan; (3) "Chemical Composition of Common Cast Iron for Boilers," by G. Sirovich and G. Yanzetti, Milan (Italian Exchange Paper); (4) "Heat-Treatment of Cast-Iron Cylinder Liners," by W. P. Eddy, Jun., General Motors Truck Corp., Pontiac, Mich.

10 a.m.—SESSION 11—MALLEABLE CAST IRON. (1) "Metallography of Ferrite in Malleable Cast Iron," by H. A. Schwartz and C. H. Junge, National Malleable & Steel Castings Company, Cleveland, Ohio; (2) "Effects of Copper in Malleable Cast Iron," by Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, Ohio; (3) "Report of Committee on Nomenclature," by W. R. Bean, Whiting Corp., Harvey, Ill.

10 a.m.—SESSION 12—MATERIALS HANDLING. (1) "Selecting Foundry Equipment as an Investment," by R. J. Heisserman, Link Belt Company, Philadelphia, Pa.; (2) "Foundry Maintenance," by James Thomson, Continental Roll & Steel Foundry Company, East Chicago, Ind.

12.15 p.m.—MALLEABLE CAST IRON Round Table Luncheon.

12.15 p.m.—CAST IRON Round Table Luncheon.

3 p.m.—Special Lecture—Annual Business Meeting.

4 to 5.30 p.m.—Shop Operation Course (Sand Control and Cupola Practice).

Friday, October 26.

10 a.m.—SESSION 13—SAND CONTROL AND RESEARCH. (1) "Comparison of Some Methods Used in Determining the Fineness of Sands," by R. C. Hill, Cornell University, Ithaca, N.Y.; (2) "Analysis of Sea Coal as Applied to Black Sand," by R. E. Aptekar, Ypsilanti, Mich.; (3) "Effect of Silt on Bending Strength of Sands," by Dr. H. Ries, Cornell University, Ithaca, N.Y.

10 a.m.—SESSION 14—JOINT A.F.A. AND A.S.T.M. MEETING on Cast-Iron Tests and Specifications. (1) "Test-Bars," by J. T. MacKenzie, American Cast Iron Pipe Company, Birmingham, Ala.; (2) "Investigation of Test-Bars," by C. M. Saeger, Jun., U.S. Bureau of Standards, Washington, D.C.; (3) "Horizontally-Poured Test-Bars," by Garnet Phillips, Frank Foundries, Moline, Ill.; (4) "Fatigue Tests of High-Strength Cast Irons," by H. F. Moore and J. J. Picco, University of Illinois, Urbana, Ill.

10 a.m.—SESSION 15—REFRACTORIES.

12.30 p.m.—Special Visit to Plant of Bethlehem Steel Company, Bethlehem, Pa., under auspices of Philadelphia Foundrymen's Association. Trip by train.

Exhibits open daily at 9 a.m. to 5.30 p.m., except Thursday, when the closing hour will be 10 p.m.

NOTE.—Annual football match between U.S. Navy and University of Pennsylvania will take place at Franklin Field, Philalelphia, on Saturday afternoon, October 27.

Annealing Black-Heart Malleable Iron in Caron's Cementation Medium

The effect of Caron's cementation medium consisting of 60 parts of charcoal and 40 parts of barium carbonate, when used as packing material for black-heart malleable iron, has been studied by M. Paschke and H. Schuster.* The composition of the unannealed iron was:—T.C., 2.43 to 2.53; Si, 0.98 to 1.24; Mn, 0.22; P, 0.07, and S, 0.03 per cent. Cylindrical test-pieces of 0.47 in. dia. and tensile test-bars were annealed under the same conditions in the cementation medium and in sand. Heating to the annealing temperature of 975 deg. C. took about 5 hrs. The decomposition of the free carbides being complete, the iron was cooled down to 700 deg. C. in 2 hrs. and kept at this temperature until fully annealed. At regular intervals test-pieces were taken from the furnace and examined.

The graphitisation curves do not indicate any accelerating action of the cementation medium. At 975 deg. C. even a slight retardation in the beginning of the process could be noticed. Accordingly, the hardness values at 975 deg. C. are somewhat higher than with the sand-annealed test-pieces. However, once the free carbides were decomposed no difference in hardness was noticeable. As can be seen from Table I, the effect of the cementation medium upon strength and elongation of the test-pieces annealed above A_1, is negligible as well. When further annealed at 700 deg. C. the bars showed the same decrease in strength in both the packing materials. The elongation figures were the same up to an annealing time of 9 hrs., when the elongation of the sand-annealed bars began to increase more rapidly and remained higher by about 3 per cent. This difference in elongation was also found after removing a surface layer 0.01 in. thick. An explanation of this fact cannot be given.

TABLE I.—*Effect of Packing Material upon Strength and Elongation of Malleable Iron.*

Annealing.		Tensile strength.	Elongation	Packing
Time hrs.	Temp. deg. C.	Tons per sq. in.	per cent.	material.
15	825	33.2	4.74	Sand
		32.5	5.32	$BaCO_3$ + C
6	900	32.7	4.10	Sand
		32.7	4.10	$BaCO_3$ + C
4½	975	28.6	4.12	Sand
		29.3	2.65	$BaCO_3$ + C
2½	1,050	30.7	4.96	Sand
		29.8	3.50	$BaCO_3$ + C

In further experiments the effect of the CO/CO_2 mixture evolved from the cementation medium, has been studied. The annealing boxes were filled with the cementation medium but half full, and the bars suspended to the top of the box so that the gases could flow around them. For comparison, further bars were annealed in sand, $BaCO_3$ + C, and air. It was found that the gas mixture had no effect either on the graphitisation or the strength. By analysis the composition of the gases was found to be:—CO 97.8 and CO_2 2.2 per cent. at 900 deg. C.; and CO 80.2 and CO_2 19.8 per cent. at 700 deg. C. According to Schenck's diagram such mixtures can only exert a carburising action, which, because of the high-carbon content, is out of question in the case of malleable iron.

MESSRS. JOHN G. KINCAID & COMPANY, LIMITED, Greenock, have received the contract to build the engines and propelling machinery for the Elder Dempster 10,000-ton passenger liner, to be built by Messrs. Cammell Laird & Company, Limited. Messrs. Kincaid are one of the busiest engineering firms on the Clyde, having at present ten sets of large Diesel engines in hand.

* "Die Giesserei," 1934, Nos. 23-24.

Aims and Objects of the Institute of British Foundrymen

DISCUSSION

When Mr. Makemson gave an address on this subject before the London Branch, little criticism was offered of its present activities, and the discussion centred around the question of the recruitment and training of entrants to the industry. It was opened by

MR. F. C. NURCOMBE, who referred to the apprenticeship problem, and urged that the Institute must build for posterity as well as for the present; he felt definitely that the industry was not doing enough in this direction. One heard managers complain of lack of industry, and particularly of lack of intelligence, on the part of apprentices. Possibly, the majority rather lacked intelligence; but there was a few, at any rate, who needed only encouragement. He mentioned in this respect that an institute of engineers, of which he was a member, had created, not a junior section, but a student membership, at a nominal subscription (5s.), whereby students were encouraged to attend meetings and also, if they wished, to take part in the discussions. In that way they managed to glean a certain amount of useful information; but, what was particularly important, their elders recognised in them the potential leaders of the industry, and gave them the necessary guidance.

MR. V. C. FAULKNER (Past-President of the Institute) pointed out that a few years ago a Junior Section was formed in London, and he was one of the very few members who had given it much personal support; but they had found, as they would always find, that such activities always clashed directly with the evening classes, and youngsters could spend their time more profitably at evening classes than even at the Institute's meetings. The Sir John Cass Technical Institute arranged for foundry lectures, some of which were delivered on the same evenings as those on which the London Branch meetings were held, and unless members were prepared to sacrifice their Saturdays, they had better leave alone the question of attracting youngsters to Institute meetings.

MR. C. H. KAIN (Past-Branch-President) said that Mr. Nurcombe had struck the right note when he had urged building for posterity and aiming to make the Institute a greater and stronger organisation. As one of the younger members of the Institute, he took up the cudgels on behalf of the much-maligned apprentice. He drew attention to the fact that in the Anglo-Saxon "Chronicle" the scribes of the eighth and ninth centuries had deplored the depreciation in the quality of the youth of their time; they had said that the young men of the day were no good and that the country was going to the dogs. Ever since the world began the young men had never been as good as the old men. Mr. Kain urged, however, that the quality was available, and that, if the young men failed, it was because the older men, who should be leading them, had failed in their leadership. The fault was not with the boy, but with the teacher.

With regard to "rule of thumb," which was referred to very slightingly in all technical discussions, he claimed that it was the rule on which the reputation of this country for high-class workmanship and craftsmanship had been built up. Scientific developments were of comparatively modern growth, whereas the British reputation for workmanship had been built up over ten or twelve centuries. It was built entirely on "rule of thumb," a rule which was the result of a lifetime's experience in a trade or craft, in many cases being inherited, so that it became an instinctive skill. He suggested that many of the technical improvements and technical Papers which, particularly a few years ago, were hailed as such wonderful achievements, were largely the result of making "rule of thumb" articulate. The old craftsman was often illiterate and unable to convey his knowledge.

In his own presidential address to the London Branch a year ago, continued Mr. Kain, he had pleaded that the Institute should devote itself to encouraging quality as opposed to quantity, because in that lay the secret of any success that it would achieve. Foundrymen should aim at quality all the time, and leave the problem of quantity entirely to commercial interests, for foundrymen as technical men were primarily concerned with producing good-quality castings, and not necessarily producing colossal quantities on a conveyor.

Getting the best out of Membership.

Commenting on the question as to what the members of the Institute got out of their membership, he said he could speak very feelingly on that matter, because during his first two or three years of membership he had got nothing out of it at all. Then he had commenced to know the members better, to discuss problems with them, and occasionally had had the audacity to speak at the meetings, and he had found that by airing his own views and, he hoped, giving somebody else something, he began to gain much from his membership. One obtained just as much out of such an Institute as one put into it, and must be prepared to discuss a technical problem as a technical problem. A man with a commercial axe to grind, and who hoped to get knowledge for nothing, would get little out of it in the end.

Finally, he supported strongly Mr. Makemson's views as to the educational advantages of visiting other foundries at home and abroad.

MR. H. O. SLATER (a Past Branch-President) recalled that in his presidential address in 1921 he had advocated the education of the moulder. That had been realised, and the industry had progressed not only from the metallurgical and scientific side but also from the practical side. One was not doing the practical moulder justice in suggesting that he was unintelligent, the difficulty being due in some cases in the past to lack of intelligence and knowledge on the part of the employers by discontinuing the systematic training of the foundry apprentice, including metallurgy and costing. He had always urged thorough education for the foundryman, so that he could take control of the foundry and would not allow the engineer to usurp the position which the foundryman should hold.

MR. MAKEMSON, in his reply, said that inasmuch as the members had not criticised the work of the Institute to any extent, he could only assume that they were quite satisfied with what the Institute was trying to do. Replying to Mr. Nurcombe's question as to whether enough was being done for the apprentices, he said he did not think so. The Institute was doing much in connection with the technical training of apprentices through evening classes and various types of courses, but he felt the time had come when more attention should be devoted to the practical training of apprentices in the shops. Mr. Slater had rather hinted that such training had gone by the board in recent years, and to a large extent it had; but sooner or later something must be done to revive more practical apprenticeship training in the shops.

With regard to the suggested student membership, he said that if the Institute's rules were finally approved by the Privy Council there would be instituted a grade of Associateship for students, at a fee of 5s. per year. The students would form a sort of sub-section of the Associate grade. The reason explained by Mr. Faulkner as to why the Junior Sections were not successful was correct, *i.e.*, that the boys who otherwise would attend the Junior Section meetings were probably taking more intensive courses at schools, and he would advise systematic courses at schools rather than membership of a Junior Section, much as he admired the work that the sections endeavoured to do.

Commenting on Mr. Kain's reference to "rule of thumb," he did not wish it to be thought that he despised the so-called practical work of the practical man; he claimed to be a practical man himself. It was true that the country's reputation for craftsmanship had been built up on the perhaps old-fashioned "rule of thumb"; but a change had occurred in recent years, and he believed Mr. Kain would be the first to agree that to-day practical experience was not quite enough and that something additional was required.

Mr. Makemson heartily agreed that one got out of the Institute, or anything else, just what one put into it; if a man joined solely for what he could get out of it, he would be disappointed. It was all a question of mutual co-operation, and one must give if one were to benefit; a man who was willing to give of his own experience would certainly get back as much as he gave, and with a considerable interest.

MR. H. O. SLATER made it clear that he was not directing his remarks to anything that was said in Mr. Makemson's address, but was rather criticising what had been stated in the Press and sometimes at meetings.

Vote of Thanks

MR. V. DELPORT (Junior Vice-President of the Branch), proposing a vote of thanks to Mr. Makemson, said that by his address he had rendered great service. Mr. Delport admitted that, although he had been taking part in the Institute's activities for a number of years, he had hardly realised that its objects were so many, and he believed that very few of the members realised that there were so many activities. By his address to the Branch, Mr. Makemson had possibly been preaching to the converted, but it was to be hoped that that address would be given the widest publicity, so that those who should be members would learn what the Institute was doing for the trade as a whole.

On a number of occasions he had been impressed by the feeling that there was some sort of antagonism between the metallurgist and the so-called practical man. In his view, however, there was no call for such antagonism, and he felt that sometimes those concerned were a little too sensitive on this matter. He could give the assurance that all the members of the Institute with whom he had been in contact, both in Committee work and at ordinary meetings, were striving together to achieve a common object, and he firmly believed that the foundry industry as a whole could not progress further without the work both of the scientific researcher and of the practical man. They were both working for the good of the industry and worthy of respect.

MR. KENT seconded the resolution, and intimated that he hoped to introduce some new members at the next meeting.

MR. V. C. FAULKNER supported the resolution, and took the opportunity to point out that "rule of thumb" did not mean practical experience or the results of logical thinking; it was originally intended to refer to pure guess work, and therefore "rule of thumb" deserved to be decried. He recalled Shakespeare's passage:

> "By the pricking of my thumbs,
> Something wicked this way comes."

The vote of thanks was carried with enthusiasm.

(*Concluded on next page.*)

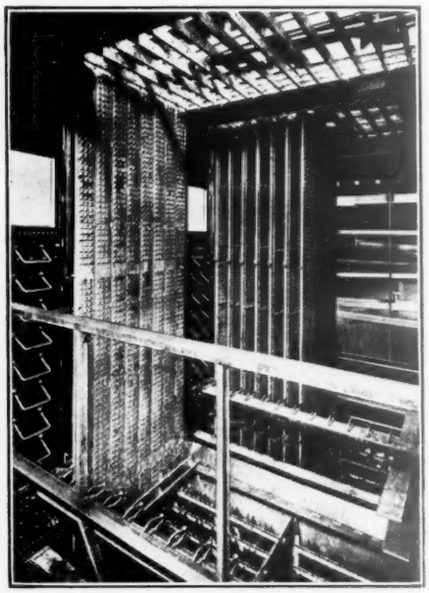
Efficient Dust Separation

ADVANTAGES OF ELECTROSTATIC METHODS

BY OUR ENGINEERING CORRESPONDENT

For the separation of dust extensive experience in many different fields, and especially the metallurgical industries, has shown the great value of the electrostatic method. This applies especially in the case of the "Lodge-Cottrell" equipment, which is represented by over 3,000 electro-filters, some of the latest and most important developments including the complete cleaning of blast furnace gas on the 2-stage principle, and the treatment of chimney gases when pulverised fuel firing is used. An average of 95-98 per cent. of the total dust is removed from air or gas, irrespective of the size of the particles, a highly important practical point since the removal of particles below 10 microns (1 micron equals one thousandth part of a millimetre), practically in the "cloud" stage, is extremely difficult by ordinary methods.

There seems to have been in the past a general impression that electrostatic methods of dust separation, in spite of their admitted



"LODGE-COTTRELL" ELECTROFILTER.

efficiency, are costly in power consumption. This, however, is incorrect, the total net power consumption being in many cases considerably less for example than either centrifugal or water washing methods.

Because of the effective co-operation of the five main companies operating the "Lodge-Cottrell" process in Great Britain, the United States, and Germany, with pooling of all patents and experience, the electrical power required now averages only 1½-2 kw.-hrs. per 1,000,000 cubic feet of air, combustion gas or other medium.

The practical pioneer in this field is Sir Oliver Lodge, whose work on the subject dates back to 1883, and the modern "Lodge-Cottrell" service represents an association of the patents, researches and experience of Sir Oliver Lodge in Great Britain, Dr. F. G. Cottrell in the United States, and Dr. Erwin Moller in Germany, the British Company being Lodge-Cottrell Limited, of Birmingham (George Street Parade), and London, which developed from the original Lodge Fume Deposit Company.

Essentially it will be remembered the basic principle consists in the use of chambers or towers, made of say concrete, through which passes the dust or fume ladened air or gas. In the towers is a series of vertical metal plates or pipes forming collector electrodes, which are connected to the earth. In the narrow spaces between these plates, or in the pipes, hang wires or rods with numerous points, forming the discharge electrodes. The latter are coupled to a high tension direct current supply so that a brush discharge takes place, giving a glow of light or corona and creating a powerful electrostatic field. As the gases pass through this field all the solid or liquid particles are electrified and repelled against the earthed collector electrodes, that is the pipes or plates. Here they give up their charge and fall down to the bottom of the tower into a hopper, or partly adhere to the plates, while the dust free gas passed on. For this reason the collector electrodes are equipped when necessary with motor driven rapping hammers to shake off the dust, while the high tension current is produced by stepping up the ordinary low tension supply in a special transformer, and then converting it to direct current by a motor driven rectifier.

As a result, well over 90 per cent., and often more than 95 per cent. of the total dust in the gases is separated in the dry stage, as already indicated, irrespective of the size of the dust particles, or the number per unit volume.

Propulsion of the "Queen Mary"

Eight large bronze propellers were ordered for the new mammoth Cunarder "Queen Mary," and of these, four will be working and four spare, the order being equally divided between Messrs. J. Stone & Company, Limited, of Deptford, London, S.E., and the Manganese Bronze & Brass Company, of Millwall.

Those supplied by Messrs. J. Stone & Company, Limited, are made of Turbiston bronze and for each casting 53 tons of this alloy was used. The propellers, which are four bladed, are nearly 20 ft. in diameter, the pitch being 18 ft. 2 ins. while the finished weight of each is 35 tons; the propeller cone caps which are also made of the same metal weigh nearly one ton each. These propellers are the largest in the world and exceed the next heaviest by over ten tons each. The mould which was placed in the casting pit was of brick and loam construction and weighed nearly 80 tons. The metal was carried from the furnaces by overhead travelling cranes in 20-ton ladles. This casting took eight days to cool before being removed from the casting pit.

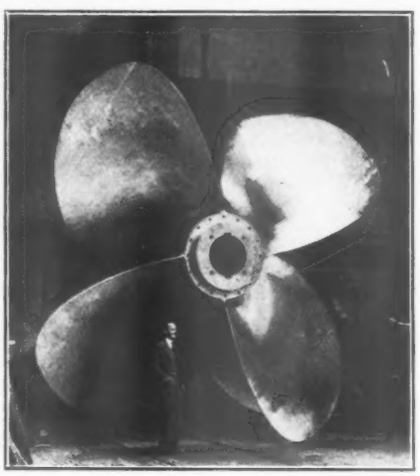
Each propeller casting was transferred to the machine shops by overhead travelling cranes and placed on the vertical boring mill—this boring mill is the largest of its kind in the world and weighs over 165 tons and is mounted on a concrete foundation for which over 200 tons of concrete were used. The first operation on the machine was the removal of the feeding head which weighed over ten tons and the cutting off was done by a circular saw 6 ft. in diameter—this is the largest circular saw yet employed for cutting through metal. The boss of the propeller, which eventually takes the propeller shaft, is then bored out followed by the facing of the fore and aft of the boss and cutting of the shaft keyways. The propeller was then transferred to a propeller planing machine and the blades planed true to pitch—here again the planing machines are unique, being the only ones of their kind in the world. The propeller is then polished all over by rotary grinders and polishers and when finished has a mirror like finish.

Each propeller is subjected to a severe test on a balancing machine whereon by the slightest touch of the finger on the extreme edge of the blade, the propeller will revolve, and can be stopped again with equal ease, so true is the balance.

The transport of these propellers to the Clyde was a difficult problem, as they were too large to send by rail while to have used road haulage all the way would have been practically impossible. They were eventually taken by road—each propeller occupying a large eight wheel adjustable lorry—to the Surrey Commercial Docks and lifted by one of the Port of London's floating cranes into a cargo vessel and transported to the Clyde. It was necessary to do the road transport by night, and then by a special police permit owing to the huge size of the propellers—each is wider than an omnibus and tramcar placed side by side, and owing to the weight—35 tons each plus 10 tons the weight of the lorry—an indemnity had to be furnished to all the highway and bridge authorities over whose roads or bridges the propellers passed.

For comparison purposes the weight and dimensions of propellers fitted to other large liners are given—all these are made of Stone's Turbiston bronze.

Ship.	Casting weight.	Finished weight.	Diameter.
	Tons.	Tons.	ft. in.
Queen Mary	53	35	20 0
Mauretania	29	18¼	16 9
Majestic	30	15¼	16 6
Bremen	35	18¾	16 5
Europa	27	14	15 0



THE LARGEST MANGANESE-BRONZE PROPELLER EVER MADE.

Propellers in Stone's bronze were first made in 1899 and since have been supplied to the world's navies and mercantile marine and are fitted on the largest and fastest vessels afloat—during the Great War over 5,000 tons of propellers were supplied by Stone's for the British Navy, also many thousands of tons for the Allied Fleets.

Aims and Objects of the Institute of British Foundrymen

(*Concluded from previous page.*)

MR. MAKEMSON, in the course of a brief response, said that the Institute had a great many irons in the fire, and, fortunately, it was successful in keeping nearly all of them warm, but it must have a larger fire. In other words, it must have more members, more support, and more active support. He pleaded for all members to do their best to make the Institute stronger not only numerically, but financially, for it must spend money if its work were to develop further.

The meeting then closed.

The Luxemburg Iron Industry*

ITS DEVELOPMENT AND PRESENT CONSTITUTION

By Arthur Kipgen (Joint Managing-Director of A.R.B.E.D.-Terres Rouges)

In 1902, for the first time, the members of the Iron and Steel Institute honoured our small country with a visit. There are possibly some who took part in that first excursion, and who will remember what they saw at the time. Such, however, as did not, will find, in the "Journal" of the Institute, a report of that journey, together with a description of the Luxemburg works visited on that occasion. This account will constitute a valuable starting point in forming an idea of the progress accomplished by the Luxemburg iron industry within the past 32 years. In order to illustrate the actual advance it will suffice to say that from 1902 up to the record year 1929, the production of iron in Luxemburg increased sevenfold. To-day, the Grand Duchy ranks eighth among the steel-producing countries, after the United States, Germany, Great Britain, Russia, France, Japan and Belgium.

In most of the other industrial countries, the iron industry was, already at an early date, established in coal or iron-ore districts, on which basis it is still standing to-day. Profiting by a relatively stable economic position, it was able to follow a regular course of development, having, on the whole, only to keep abreast of a normal technical evolution in order to hold its own with competitors. In Luxemburg, on the contrary, the frequent changes in the political and economic situation retarded for a long time the normal evolution of the iron industry which, moreover, was transferred, yet later, to an altogether different basis. Indeed, it is only since the second half of the nineteenth century that the iron industry, in its present form, has been established on the minette-ore deposits (colitic limonite) discovered in the southern part of the country; but its final consolidation only became possible after the invention of the Thomas-Gilchrist process.

The present iron industry is the descendant of an industry of modest appearance, but of very old standing, located for the greater part in the centre of the country, in the vicinity of alluvial ore deposits and vast forests which supplied the charcoal used. Archæological discoveries enable it to be stated with certainty that, in Luxemburg, mining was practised and iron produced, as far back as the Celtic and Gallo-Roman periods. Strange to say, however, not only alluvial ore was won, but also minette ore which, afterwards, fell into oblivion and remained entirely forgotten for hundreds of years. The iron was produced by the direct process from ore and charcoal in "sinking" fires, the driving of the bellows and the forging of the iron being done by hand. It is interesting to mention that the Romans already used slag from the forges for the foundations of certain roads made by them in the country.

During the Middle Ages the direct production of iron was carried on by a process improved by the Catalan iron makers. Still, only alluvial iron ore was used. As early as the tenth century, Luxemburg iron was exported to the Rhine. Yet the ironmaking of those days had not the character of an industry, but had, on the whole, the appearance of domestic craftmanship. More accurate information about the industry dates only from the beginning of the seventeenth century. The growing demand for iron resulted in the erection of more important plants on the territory occupied by the Grand Duchy of to-day. For the driving of the bellows and hammers use was made of hydraulic power from the rivers, and the indirect process for the production of iron was introduced. The pig-iron produced in blast furnaces was, for the greater part, transformed into wrought iron by refining in low hearths. Grey iron for pig-iron castings was also produced, but in small quantity.

First Blast-Furnace Plant

The first blast furnace on record, complete with a refining forge, was erected at Dommeldange in the year 1609. Other small establishments of a similar character were built in the years that followed. At the beginning of the nineteenth century, in Luxemburg, which, at that time, formed part of the French Département des Forêts, there were 10 works with 11 charcoal blast furnaces and 8 refining forges. Up to that time Luxemburg iron was exported to Holland, to the factories in the Liége region and to France. But, thereafter, the iron industry waned rapidly, having to give way to the competition of industrially-more-advanced countries, especially Great Britain.

Up to about the middle of the nineteenth century, the equipment of the forges as well as the process of manufacture did not undergo any important change, whereas other countries had, for long, applied the new discoveries which were revolutionising the iron industry, the principal dates of which may be briefly mentioned: (1) In 1735 Abraham Darby used, for the first time, coke instead of charcoal in the blast furnace. (2) In 1769 James Watt was granted the first patent for the steam engine which superseded the water wheels. (3) In 1783 Henry Cort was granted the first patent for rolling by grooved rolls which superseded hammering and slitting of the iron. (4) In 1784 the same Henry Cort invented the puddling process, using pit coal in reverberatory furnaces, which superseded charcoal-refining in low hearths. (5) In 1829 Neilson introduced the use of hot blast in the blast furnaces at the Clyde Works. This short enumeration shows that, at that time, the British were the pioneers in metallurgical matters.

On the other hand, men like Cockerill, Manby and Wilson were actively promoting the modernisation of the iron industry on the Continent; the first, in Belgium, by erecting the Seraing works, in 1817, the other two by establishing the model works of Charenton, near Paris, in 1822. It was in Britain also that the victory of pit coal and coke over charcoal had already become an accomplished fact at the beginning of the nineteenth century. With the exception of two isolated works—Le Creusot and Gleiwitz—which were already making use of the new fuel before 1800, neighbouring countries—France, Belgium and Germany successively—began to follow in this evolution, from about 1818 onwards.

According to a comparison of French figures made by Villefosse, in the year 1825, the cost of producing a metric ton of coke-made pig-iron amounted to 125 gold frs., or 99 gold shillings, as against 210 gold frs. or 167 gold shillings, for charcoal-made pig-iron. Puddled iron produced with pit coal cost 260 gold frs., or 206 gold shillings, and refined iron made with charcoal in the low hearth 650 gold frs., or 516 gold shillings, per metric ton.

Notwithstanding the great advances realised by their neighbours and the disastrous economic situation of the country, the Luxemburg iron manufacturers were compelled to remain inactive. Their lack of capital prevented them from improving their equipment. In the absence of railways, the cost of carriage of the coke by road would have been prohibitive. Moreover, there was great opposition to the importation of foreign fuel, as it was feared that the revenue drawn from the rich forests might vanish.

Period of Transition

The iron industry was thus almost entirely paralysed, when Luxemburg, constituted a Grand Duchy in 1815, actually achieved its political independence in 1839, after a third amputation of part of its territory. But, at first, the newly-acquired independence meant only an aggravation of the general situation. Severed from the surrounding countries of which it previously formed part, Luxemburg was affected by the growing tariff barrier facing its entire, new, ever-so-narrow borders. The home market was the only outlet that remained to the iron industry. The difficult situation brought about by the almost total lack of exports, against the increasing importation of foodstuffs and manufactured goods, led the Grand Duchy to join the German Zollverein in 1842. At that time its annual output amounted to about 7,300 metric tons of charcoal pig-iron, the greater part of which was conveyed to the German puddling furnaces. The quantity transformed into refined iron did not reach 600 metric tons.

After the introduction by the Zollverein of import duties on pig-iron, in 1844, and under cover of the political calm of the following years, the spirit of enterprise was roused again, and new blast furnaces were erected.

Rediscovery of Minette Ore

It was some time between 1840 and 1848—the exact date is not known—that the capital event, which forms the basis of the now existing iron industry, took place, namely, the discovery of the huge deposits of colitic minette ore forgotten ever since the Gallo-Roman period. It is true, however, that long before, certain layers of minette had been mined, but without any exact notion as to their real nature, and only for the building of bakers' ovens. The Société Auguste Metz & Cie, Eich, was the first to acquire deposits of that ore, in the vicinity of Esch, making a first trial of it in the blast furnace, between 1848 and 1850.

Taking the lead in matters of progress in the Luxemburg iron industry, they had already established the first steam engine at Eich, in 1845, and introduced air heating by a coal fire, in 1847; it was the same company also which, in 1858, started the first blast furnace, built specially for the exclusive use of coke, with utilisation of waste gases for the heating of the blast as well as the boilers.

By reducing minette with coke it was possible to obtain pig-iron suitable for puddling, at a considerably reduced price, but the new mineral riches could not thoroughly be turned to advantage until the completion, between the years 1859 and 1862, of the main railway lines in the Grand Duchy. The way was thus opened for the importation of coke and the exportation of ores and pig-iron, under favourable conditions of transport.

In 1868, coke had entirely superseded charcoal. Running parallel with this evolution alluvial ore was replaced by minette ore in the burden. The consumption of minette which was only 20,000 metric tons in 1862, rose to 368,000 metric tons in 1870, in which year the extraction already reached 911,695 metric tons. However, exports to Germany and Belgium which had greatly increased since 1865, considerably exceeded the home consumption. But the Luxemburg Government issued, in 1867, a regulation by which the granting of further mining concessions was made dependent on the working of the iron ore on the spot, with the result that numerous blast furnaces were now erected in the southern part of the country. In this manner the iron industry began to move towards the neighbourhood of the minette ore deposits and the railway lines, from the year 1870 onwards,

* Paper presented in Luxemburg on Thursday, September 13, 1934, on the occasion of the Autumn Meeting of the Iron and Steel Institute.

when a real fever of construction set in. In less than three years ten new blast furnaces had been built at Esch, Rodange and Rumelange.

The production of wrought iron, which had been extremely small until then, died out in 1862, and the only puddling works, erected later on at Luxemburg, enjoyed but a transient existence. Exportation thus swallowed up almost the entirety of the largely-expanded production which, from 27,312 metric tons in 1865, rose to 270,377 metric tons in 1875, increasing tenfold within ten years. Then followed a retrogression caused by a crisis, aggravated by the abolition of the Zollverein's import duties on pig-iron, in 1873, and the duties on merchant iron, in 1877. The customs tariff was, however, re-established in 1879, but, shortly after, the struggle between wrought iron and steel became more acute and endangered the existence of the iron industry, which was then in a fair way of development.

The Basic-Bessemer Process

Bessemer had, in 1855, invented his process for the conversion of pig-iron into steel in the liquid state. This process was introduced abroad from 1860 onwards, and threatened to supersede puddling. Seeing that, owing to the acid lining of the converter, the elimination of phosphorus was impossible, the pig-iron, being too high in phosphorus, could not be used, and its exportation was, therefore, endangered. At this moment, which may well be said to be the most crucial in the history of the industry, the invention of the Thomas-Gilchrist process, like a *deus ex machina*, saved the iron industry, and definitely established the prosperity of the whole country. This process, indeed, succeeds in eliminating the phosphorus from the pig-iron, leaving at the same time, as a by-product of the steel, the ideal fertiliser for agriculture, basic-Bessemer slag.

On April 4, 1879, Sidney Gilchrist Thomas made the memorable demonstration of the new process at the works of Messrs. Bolckow, Vaughan & Company, Limited, Middlesbrough. Not later than April 21, 1879, the Société en Commandite des Forges d'Eich, Metz & Cie, acquired the first licence granted on the Continent by the inventors. The contract made on April 26, 1879, between Mr. Thomas and the Rheinische Stahlwerke as well as the Hoerder Verein, granted these two companies jointly the sole rights of the patent for the whole of Germany and Luxemburg, the one exception being the Société Metz & Cie.

In 1882, the Société des Forges d'Eich, in common with Mr. Victor Tesch, grandfather of the present President of A.R.B.E.D., Mr. Gaston Barbanson, and founder of the Société des Mines du Luxemburg & Forges de Sarrebruck, established the Société des Hauts-Fourneaux & Forges de Dudelange, for the purpose of working the Thomas process. This company erected the Dudelange works, comprising blast furnaces, basic-Bessemer steelworks and rolling mills; they were the first complete composite works in the country. The first charge blown therein on March 18, 1886, inaugurated the great evolution of the iron industry towards its present level. Up to 1900 the Dudelange basic-Bessemer steelworks remained the only one existing in the country. On the other hand, the number of blast furnaces increased steadily, Luxemburg basic pig-iron finding a good market in the steelworks which were being erected more or less everywhere. This basic pig-iron was, for the greater part, exported to the Rhine, Westphalia and the Saar.

Little by little, however, the German steelworks endeavoured to gain greater independence in covering their pig-iron requirements. To that end they amalgamated with companies of the Lorraine-Luxemburg basin or erected blast furnaces of their own there. On the other hand, puddled iron was superseded by basic steel, so that the markets for pig-iron for puddling were also vanishing. The very existence of the blast-furnace companies being at stake, there was no other alternative left for them but to transform their pig-iron into steel on the spot.

Extension of Basic-Bessemer Production

The Differdange works, founded in 1896, added to their blast furnaces a basic-Bessemer steelworks and rolling mills, which were started in 1900. The Rodange works, established in 1872, followed the movement in 1908. The Dommeldange blast furnaces, erected in 1865, were, in 1909, completed by an electric steelworks. A complete new composite works was built at Belval, in 1912; the Esch works, whose origin reaches back to 1871, started their basic steelworks and rolling mills in 1913. If the technical development of the works was delayed for a considerable time during the first half of the 19th century, it is now proceeding at a rapid pace and without any further break.

The high speed of production of steel which is made possible by the basic-Bessemer process has led to the enlargement of the blast furnaces. The latter were provided with Cowper stoves which have replaced the earlier iron air-heaters as well as the Whitwell stove for heating the blast. A further step was realised by the use of blast-furnace waste gases in gas engines which have superseded steam engines.

Dudelange and Differdange installed the first gas engines, in 1900. The Differdange works, in particular, were the first to attempt the lay-out of a power plant exclusively driven by gas engines, nine in number, used for the driving of dynamos as well as blowing engines. This gas power plant, which constituted a most audacious attempt at that time, cleared the way for all sorts of improvements which have followed each other in rapid succession ever since. To the two above-mentioned works belongs also the merit of having introduced gas-cleaning in the Grand Duchy of Luxemburg. It was the Differdange works also which, in 1898, purchased the American Grey patent, completed, in 1901, their rolling mills for Grey joists and, after various improvements, succeeded, the first in all the world, in definitely putting this process into operation. The name of Mr. Max Meier, former general manager of the Deutsch-Luxemburg Company, is inseparably linked with the bold innovations introduced at the Differdange works.

Electrical Developments

On the other hand, the use of electricity for the driving of works machinery is extending more and more. Dudelange established, in 1902, the first three-phase electric-motor for the driving of a hoop mill. In 1909 Dommeldange started, in Luxemburg, the production of electric steel made in induction furnaces. From the commercial point of view the works strengthened their position by adhering, in 1889, to the "Syndicat de l'Acier Lorraine Luxembourgeois," born of the competition between the Rhenish-Westphalian works and the growing power of the Lorraine-Luxemburg iron industry. This antagonism disappeared in 1904, with the creation of the German Steelworks Union, in which all the steel syndicates of the Zollverein were grouped. Finally, in 1911, the Luxemburg works joined the new German Pig-iron Syndicate.

Firmly established on a strong mineral basis extending also to Lorraine, the Luxemburg iron industry also had its coal basis secured within the Zollverein, either in Westphalia, by pits of their own, or in the basin of Aix-la-Chapelle, by long-term contracts and by merger of interests. Only one works imports fuel from Belgium.

Structure of Industry

The old family enterprises such as Metz', Brasseur's, Collart's, to quote only a few names, have made way for a few important and closely-organised joint-stock companies. In 1913 the Luxemburg works were in the hands of the following companies: (1) Deutsch-Luxemburgische Bergwerks- und Hütten A.-G.; (2) Gelsenkirchener Bergwerks A.-G.; (3) Société Anonyme d'Ougrée-Marihaye; (4) Société des Hauts-Fourneaux & Aciéries de Steinfort, and (5) Aciéries Réunies de Burbach-Eich-Dudelange (A.R.B.E.D.). A.R.B.E.D. is the result of the amalgamation of the following three ancient companies: (*a*) Forges d'Eich (Le Gallais, Metz & Company), successors to the Société Auguste Metz & Company, established in 1847; (*b*) Société Anonyme des Mines du Luxemburg & Forges de Sarrebruck, whose origin dates back to 1856; (*c*) Société Anonyme des Hauts-Fourneaux & Forges de Dudelange, constituted in 1882. This amalgamation was brought about, in 1911, by Mr. Gaston Barbanson, the present President of A.R.B.E.D., together with the late Mr. Emile Mayrisch, whose much-regretted death occurred in 1928, and who has left in the iron industry, in the International Steel Agreement*—of which he was the great promoter and first President—and in the development of the country's social institutions, a name which still lives in everyone's memory.

In 1913 the iron industry had already gained considerable importance, taking a preponderant place in the country which had formerly been of a thorough agricultural character. Still, production had not yet attained its normal level, because the two big works erected in 1912 and 1913 at Belval and Esch were only in the first stages of their activity. The world war put a stop to the ascending movement of the production which now began to shrink and, in 1919, dropped down to about one-quarter of what it had been in 1913.

Although the Grand Duchy of Luxemburg takes no part in the great political events outside its borders, these, nevertheless, exert on its economy an influence which is all the more momentous as the Luxemburg industry is obliged to import entirely from abroad one of its essential raw materials, coke, and to export from its restricted area about 98 per cent. of its considerable output of iron. During the first years after the war, the two currents were checked in all sorts of ways and production was reviving only slowly. It took pig-iron seven years and steel five to regain and surpass the figures of production of 1913.

Post-War Reorganisation of Industry

Shortly after the war new combinations of the capital invested in the industry took place. The German companies Deutsch-Luxemburg and Gelsenkirchen found themselves dispossessed of a great part of their mining and pig-iron bases, in consequence of the sequestration of their Lorraine mines and works. Furthermore, their Luxemburg works, being now severed from their parent works of the Ruhr coal basin by a customs barrier, the cost of pig-iron and semi-finished products forwarded from one country into the other must needs, after a period of transition, undergo a notable increase, on account of the German import duties.

As matters stood, the German companies found it more advisable to sell their property in Luxemburg to Franco-Belgian-Luxemburg groups. The Société Métallurgique des Terres-Rouges, Luxemburg, and the Société Minière des Terres-Rouges, in France, established in 1919, with the co-operation of A.R.B.E.D. and Messrs. Schneider & Company, entered into possession of the properties of the Gelsenkirchener Bergwerks A.-G., situated on the left bank of the Rhine. The Société Hadir, established in 1920, with the participation of various French, Belgian and Luxemburg industrial groups, took over the mines and works of the Deutsch-Luxemburgische Bergwerks- und Hütten A.-G. in Luxemburg, Lorraine and Saar.

At the same time the Grand Duchy which, after retiring from the Zollverein in 1918, could not possibly remain isolated, negotiated a customs-union agreement with Belgium which was put in force by May 1, 1922. The iron in-

* Continental Steel Cartel.

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dustry, thus severed from a highly-protectionary *régime*, endeavoured to fit itself into the new, rather free-trading system. It took good care to strengthen its raw-material bases by the acquisition of shares in other companies.

As the Belgo-Luxemburg home market absorbs only about one-fifth of the iron production of the Grand Duchy, it constitutes an insufficient compensation for the loss of the extensive outlet of the Zollverein, which absorbed about 70 per cent.

Export Trade

It is of vital importance for the Luxemburg iron industry to gain a firm footing in the great export markets. But being deprived of an appropriate commercial organism since their retirement from the German Sales Syndicates, the various companies have established their own sales offices, the ramifications of which have rapidly spread all over the world. On the other hand, they secure the outlet of part of their output by taking an interest in important finishing industries abroad, such as wire-drawing plants, etc. In 1926 the iron industry, together with Germany, Belgium, France and the Saar, established the International Steel Agreement, whose headquarters are at Luxemburg and whose organisation has been completed, since June 1, 1933, by international sales offices. Reference has already been made to the most important part played by Mr. Emile Mayrisch in the elaboration of this organisation. Mr. Aloyse Meyer, the present Director-General of Arbed-Terres Rouges, has succeeded Mr. Mayrisch as President of the above institution and has remained in charge ever since.

During the first years after the war, the problem of supplies, as well as of economic and commercial reorganisation, prevailed over all other questions. Later on Luxemburg manufacturers were in a position to give their full attention to technical matters. The works were modernised and their mechanisation was pushed as far as possible, the production being at the same time rationalised.

In 1927, A.R.B.E.D. and Terres-Rouges completed the inter-connection of their three works seated at Esch, as well as of those of Audun-le-Tiche, so as to enable them mutually to exchange liquid pig-iron, blast-furnace gases and electric current. Those four works, with 18 blast furnaces, two steelworks and 14 rolling mills, are thus practically one, working under considerably improved conditions of production. The Esch and Belval works increased the diameters of their converters and the blooming mill at Esch (A.R.B.E.D.) was converted to electric drive.

Dudelange started, in 1926, the first sheet mill in the country and replaced, as from 1929, their six blast furnaces, producing individually 150 metric tons per 24 hrs., by three big blast furnaces with a daily output of 500 metric tons each. Differdange have entirely transformed the charging apparatus of their ten blast furnaces and doubled the output capacity of their Grey joists mill. All the works of the country have been interconnected by high-tension lines, and supply the current to the national distributing grid, which was begun in 1928 and was entirely completed in 1931.

As indicating the growth of the iron and steel industry since the introduction of the basic-Bessemer process up to the year of its highest output, *i.e.*, 1929, it may be mentioned that in 1886 there were 21 blast furnaces, 30 in 1902, and 46 in 1913 and 1929. The pig-iron output during the years under review was 400,644 metric tons, 1,080,305 metric tons, 2,457,861 metric tons and 2,906,093 metric tons respectively. As for steel, the figures increased from about 26,000 metric tons in 1886 to about 370,000 metric tons in 1902, 1,425,310 metric tons in 1913 and 2,702,257 metric tons in 1929.

Vertical Combinations

Simultaneously with the enormous increase of the output, a complete modification in the structure of the Luxemburg iron industry has been achieved; horizontal at the beginning, it has become vertical, *i.e.*, the production has gradually been directed towards the finishing stage, passing through all intermediate stages, from the raw material up to the finished product. In 1913 the proportion of pig-iron production which was converted into steel was only 64 per cent., whereas, in 1929, it was transformed almost entirely. In 1913 the production of the rolling mills comprised about 41 per cent. of semi-finished products and 59 per cent. of finished products. Of the output of 2,127,282 metric tons produced by the rolling mills in 1929, which is almost twice that of 1913, 90 per cent. are finished products.

The great world crisis has brought about a decrease of output, which, in 1933, amounted to 1,887,538 metric tons for pig-iron and 1,844,831 metric tons for steel. Compared with 1929, the reductions are 35 per cent. and 32 per cent. respectively. Of the 41 blast furnaces existing to-day, 21 are in blast.

The total number of workmen employed in the mining and metallurgical industry of the country was only 5,326 in 1886; in 1929 it had increased to 28,938 with 40 per cent. foreigners. At the present moment their number is about 17,400 with 25 per cent. foreigners.

The concentration which, since 1919, has been emphasised in the iron industry, has resulted in the combination of works into (1) A.R.B.E.D., in association with the Société Métallurgique des Terres-Rouges, whose capital the former took over almost entirely in 1926; (2) Hauts-Fourneaux et Aciéries de Differdange-St. Ingbert-Rumelange (Hadir); (3) Société Anonyme d'Ougrée-Marihaye, Rodange Works. There is a fourth company which, however, stopped working in 1931, the Société des Hauts-Fourneaux & Aciéries de Steinfort.

The Grand Duchy possesses a most up-to-date social-welfare service, comprising: insurance against accidents, illness, old age and infirmity, and paid holidays for workpeople; a pension fund and the legal regulation of the private employees' contracts, for clerks. The various works have, in addition and of their own accord, created a number of private social institutions, such as children's tuberculosis-prevention institution, open-air schools, professional schools, scholarships and educational allowances, housing accommodation for both clerks and workpeople, old-age homes for workpeople, hospitals, services of social assistance, etc. Therefore, in spite of the great proportion of foreigners among the working classes, employers and employees are living on excellent terms, and labour troubles have been very scarce in the country.

The foregoing is sprinkled with British names. Luxemburg owes a great debt of gratitude to Thomas and Gilchrist, whose invention has been the starting point of the brilliant impulse of the iron industry in Luxemburg, contributing at the same time to the thriving prosperity of the country's agriculture. The use of basic slag has trebled the yield of the soil, which, in its turn, has led to the amelioration of the live-stock of the country. Thomas and Gilchrist have thus established an indissoluble bond between Great Britain and Luxemburg.

Publication Received

The Batelle Memorial Institute of Colombus, Ohio, the researches emanating from which are so profoundly admired in Europe, has issued a very handsomely-prepared brochure outlining its activities and illustrating its principal departments. The Institute is financially independent, but carries out a certain amount of research but not routine testing—for industry on predetermined contract basis. The Institute, obviously, possesses splendid research equipment, including what appears to be a very up-to-date foundry, complete with an electric melting furnace.

The Non-Ferrous Scrap Position

By "Onlooker."

The non-ferrous scrap metal trade has had rather a run of misfortunes of late, and the outlook at the moment is not, it must be confessed, a very rosy one. When Germany first found it necessary to limit her imports of raw material, many scrap metal merchants who had been trading with the Reich found their business at first very severely curtailed and eventually eliminated altogether, as a result of which there are a number of exporting houses with sales contracts on their books which look like remaining unexecuted for a long time to come. Germany has always been a large buyer of scrap, and her withdrawal has proved to be a serious upset for the scrap metal fraternity here.

On the other hand, consumers in this country, who had perforce gone short of scrap because dealers were able to obtain better prices on the Continent than the foundries here were prepared to pay, rather welcomed the changed aspect of affairs as likely to make matters better for them. To some extent this expectation has been fulfilled, much of the advantage coming from the fact that American material which formerly went to Germany was diverted to Britain, and for a time the situation here improved quite considerably. Unfortunately the change was short lived, for with the raising of the American domestic quotation to 9 cents and the decline in the export price to about 7 cents in line with the fall in sterling values, the exportation of old metals from the States became an unfavourable proposition, and shipments have declined accordingly.

In this way the resumption of scrap business with America has been very short lived, and dealers are thrown back on to the handling of old metals arising from the shipbreaking yards, Post Office, railways and Government disposals. The tonnage from these sources is of course limited, and the amount of brass scrap coming out for sale to consumers is certainly not sufficient to cover the demand from the foundries and mills who are in many cases receiving orders which formerly went to Germany. The position in the States is that only those parcels of scrap lying at points, so far removed from the refineries as to make the ocean freight cheaper than rail carriage to the refineries, are finding their way to Europe, and in consequence much of the metal coming across is none too good. In plain English, we are getting what America does not want herself, and the top and bottom of that is that complaints by customers are more numerous than dealers find pleasant!

As to residues, the position is fast becoming hopeless as far as low-grade material is concerned, and sulphate makers and others who have been accustomed to buy this class of stuff in the past are now finding that the best offers they can make are so low as to make it impossible for holders to do business. Where supplies can be obtained locally and the delivery cost is almost negligible, it is still possible to do something with low-grade copper-bearing material, but haulage over any considerable distance stops all chance of doing business. In view of the outlook for copper and spelter and the unlikelihood of any improvement in these quotations, it looks very much as if those connected with the scrap trade will have to be very patient!

Statistical Report of American Iron and Steel Institute

The American Iron and Steel Institute has issued its Annual Statistical Report for 1933, which is the twenty-first of the series. It contains the usual detailed statistics of the iron and steel and certain allied industries of the United States and Canada for 1933 and preceding years, as well as data relating to the principal foreign countries. The Report is published at the Institute's headquarters, 350, Fifth Avenue, New York.

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Moulding a Centrifugal Pump Casing by Strickling

For moulding the casing of a centrifugal pump, shown in Fig. 1, the pit is filled up in the centre corresponding to the strickle board, *a*, in Fig. 2, with its centre forming part of the coreprint and the central opening of the casing, after the spindle has been placed. The prolongation of the strickle board forms a horizontal plane for supporting the top part; the part between both ends has the shape of the core, and forms with the skeleton pattern, shown in Fig. 3, the corebox. The lower part of the mould is made with this pattern, and is used primarily as a corebox. This skeleton pattern, *a*, is composed of single segments, overlapping each other, and has the shape of the spiral casing. The wall thickness of the casing is formed by putting down the arch pieces, *c* and *d*, and connecting board, *b*, is placed. In its centre it has a round hole, of the same diameter as the spindle. This being done, the mould for the spiral core may be formed. After removing the templet, the pattern (Fig. 3), with its attached brackets and flange, is laid in the pit, which has previously been prepared to correspond with the shape of the spiral casing.

The skeleton, being formed by the segment pieces and held by the pattern, has then the

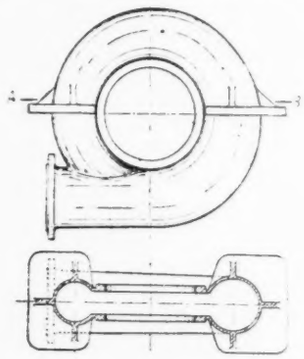

FIG. 1.

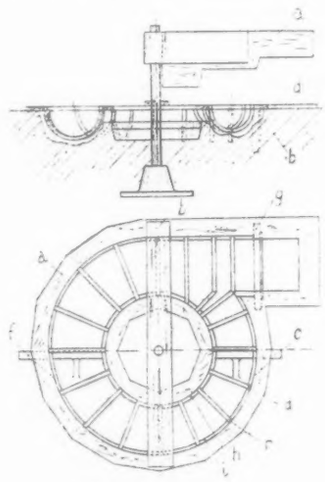

FIG. 2 (upper).
FIG. 3 (lower).

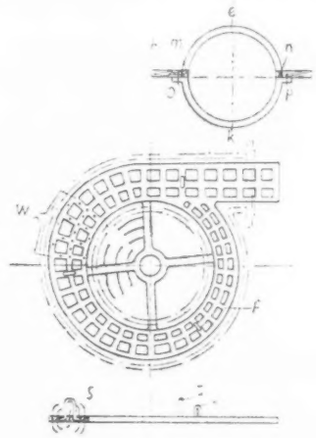

FIG. 4 (upper).
FIG. 5 (lower).

the segment pieces, *h* and *i*. These arch pieces form the outer circumference of the spiral and its inner width. They are fastened at certain distances according to the manner, shown in Fig. 4, on to the skeleton pattern. The lower curved pieces, *k*, are fixed on to the pattern, *h*, by the dowels, *o* and *p*. Upon the lower curved piece, *k*, the upper curved piece, *l*, is placed. From one curved piece to the next one, the segment pieces, *m* and *n*, forming a sixteenth of the whole circumference, are placed. These pieces are fastened to the pattern with dowels

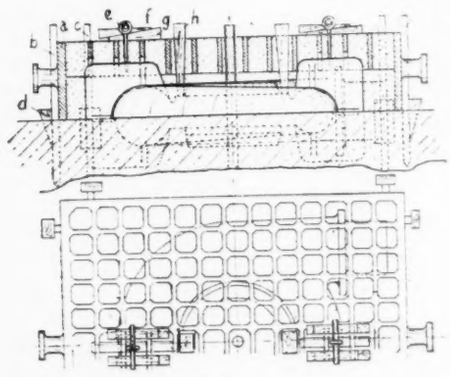

FIG. 6.

and are designated by successive numbers, being also marked on the corresponding place of the pattern in order that each one may be placed in the right place after being removed.

On the pattern, *a* (Fig. 3), half of the inverted pattern of the brackets, *e* and *f*, of the spiral casing is fastened with dowels. Half of the flange pattern is fastened in the same manner. Above the outer part of the pattern, *a*, and the inner part, containing the segment pieces, the inner form of the core and the outer form of the spiral casing. At first the upper curved pieces are taken off and the lower curved pieces and the intermediate segment pieces, lying in the pattern, are loosened, in order that they may remain in the mould during the stripping. The loose pieces are stripped. The mould is filled up as far as the edge of the inner diameter of each curved piece, corresponding to the inner diameter of the spiral. Then the connecting board, hindering the finishing of the mould, is removed. The mould, serving as corebox, has to be smooth and clean, and is varnished after being washed with a mixture of plaster of Paris and water.

In the meantime, the core-iron (Fig. 5) has been cast, with square holes in it, in order that it may be easily broken for removing it from the casting. Into this iron armature, bent rods, *m*, are cast, for providing a better hold for the

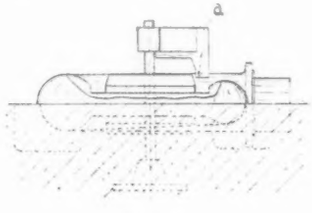

FIG. 7.

core sand. After the corebox has been partly filled with sand, the core-iron is put in, together with some coke in the centre to provide a vent for the gases. After the lower part has been formed, the curved pieces are replaced upon the pattern and the upper part is moulded. This makes the outer form of the spiral of the cage and serves primarily for moulding the upper part of the casing in the top part. The wall thickness is later removed, and makes the pattern for the core, having the inner diameter of the spiral. Above the prepared casing mould, made in this simple manner, the top part is put on, as is shown in Fig. 6, and held in its place by spikes. Behind each spike a wedge, *d*, is driven in for stiffening the spike. The runners, *h*, are put on after having partly filled up the top part with sand. The pattern of the brackets are provided with eye bolts, *e*, and after being filled up, rods are put through these eyes and fastened with wedges, *f* and *g*, so that the patterns are lifted up together with the cope. The cope is raised, the rods loosened and the patterns withdrawn. The cope is then finished and dried.

From the core, lying now in the lower part of the mould, the curved pieces, which were used in forming it, are removed, and with board *o* (Fig. 7), the core for the centre is swept. The core is then taken out and hung up by means of hooks on two iron rods, finished and dried. From the lower half of the mould the curved and segment pieces are removed, together with the patterns for brackets and flange, after which the layer of sand, designating the wall thickness, is scratched out. The mould is then finished and dried. Now the mould may be reassembled and made ready for pouring in the usual manner.—(*Translated from "Die Giesserei-praxis."*)

Catalogue Received

Cleaning Castings. The American Foundry Equipment Company, of Mishawaka, Indiana, U.S.A., have sent us two catalogues dealing with the Wheelabrator. To the best of our knowledge, this is the only machine which claims to clean metallic surfaces by the impingement of a stream of abrasive without the use of compressed air. Just how it works is not clearly shown, but we imagine that centrifugal force is used. The system allows large areas to be covered, as neither hose pipe nor nozzle is incorporated. Many economies are claimed in these catalogues and we are looking forward with a good deal of anticipation to seeing the first pioneer installation in Britain. No doubt we shall be hearing much about the plant from those participating in the forthcoming International Foundry Congress at Philadelphia. All the usual variations of sand-blast plant have been adapted to the Wheelabrator system, such as rotary tables, barrels and cabinets.

GLASGOW CORPORATION TRANSPORT COMMITTEE have the tender of Messrs. John Thompson Water-Tube Boilers, Limited, Wolverhampton, amounting to £51,376, for the supply of water-tube boiler plant for Pinkston Power Station.

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The fact that over half a million "Sirocco" Fan installations are in WORLD WIDE service emphasizes their pre-eminence for every conceivable industrial requirement involving the movement of air or hot gases in any desired volume and under varied conditions of operation.

Write for "Sirocco Products" which summarises in pictures our manufacturing activities

DAVIDSON & Co LTD

SIROCCO ENGINEERING WORKS, BELFAST.

BRANCHES:—LONDON, MANCHESTER, GLASGOW, BIRMINGHAM, NEWCASTLE-ON-TYNE, CARDIFF, BRISTOL, DUBLIN.

universally recognised as the leading brand of Cylinder Pig Iron

WARNER CBR

The way to BETTER castings

WARNER & CO. LTD. CARGO FLEET MIDDLESBROUGH

This Week's News in Brief

Trade Talk

THE BONNYBRIDGE SILVER BAND, composed largely of foundrymen and of which Mr. Duncan Walker, works manager of Messrs. Mitchell Russell & Company's Chattan Foundry, is president, was engaged to play at the launch of the "Queen Mary" at Clydebank

DURING THE FIRST SEVEN MONTHS of this year exports of nickel by the International Nickel Company, Limited, have been valued at $17,692,616, as compared with $10,585,155 for the corresponding period of last year, and $4,128,872 during the first seven months of 1932.

MESSRS. LITHGOWS, LIMITED, Port Glasgow, have booked an order from Messrs. J. & C. Harrison, Limited, London, for a cargo steamer of about 9,500 tons deadweight capacity. The propelling machinery will be supplied by Messrs. David Rowan & Company, Limited, Glasgow.

THE BURNTISLAND SHIPBUILDING & ENGINEERING COMPANY, LIMITED, have secured an order to build a motorship, about 150 ft. in length and 800 tons deadweight capacity, for Mr. T. J. Medcalf, London. The propelling machinery, consisting of Deutz-Diesel engines, is to be supplied by the builders.

LOCHEARNHEAD was the venue of a successful motor outing which took place last week under the joint auspices of the Larbert Art Metal Work and the Scottish Enamelling Company. The party, comprising members of the staff and employees of both concerns, travelled by way of Gleneagles and Comrie to Lochearnhead, where a sports programme was carried through.

MESSRS. WILSON & LONGBOTTOM, LIMITED, Nelson Foundry, Nelson Street, Barnsley, are busy on an order for the construction of a large batch of heavy carpet looms for export to the Continent for use in one of the largest carpet-weaving mills. The order, which amounts to over 60 tons of highly-finished textile machinery, was secured in the face of extremely severe German competition.

THE FAIRFIELD SHIPBUILDING & ENGINEERING COMPANY, LIMITED, Glasgow, launched a special depôt ship for service in connection with destroyer flotillas which they have built for the British Admiralty. The vessel, H.M.S. "Woolwich," is 610 ft. long, with a 64-ft. beam and a tonnage of 10,000. She is the largest British war vessel launched on the Clyde for several years. The launch is of particular interest, since this is the centenary year of the existence of the Fairfield Company.

MANY OF THE OPERATIVES at the Singer Factory, Kilbowie, will be placed on a full-time working week very shortly. It has been decided by the management to transfer the production of a domestic sewing machine from their German factory to Clydebank. It is expected that the transference will do much to compensate for the work recently taken to the firm's new factory at Monza, Italy. Pattern-makers and the engineers will also have more work for some time on account of the necessity for new patterns to suit the Clydebank plant.

ON FRIDAY, the employees of the warehouse department of Messrs. Smith & Wellstood's Columbian Stove Foundry, Bonnybridge, gathered together during the lunch hour to pay tribute to Mr. John Mitchell, chief shipping clerk, who was leaving to take up an appointment with a Falkirk firm. Mr. James Watson presided, and on behalf of the workers in the department Mr. Walter Bryden asked Mr. Mitchell to accept an umbrella and attaché case as a mark of esteem and token of their best wishes for his success in his new post.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

M. Owen & Company, Limited, 11, Mansel Street, Gowerton, Glam.—Capital £500. Metal merchants, etc.

Solway Pumps, Limited, 68, Victoria Street, London, S.W.1.—Capital £100. Designers and manufacturers of pumps, etc. Directors: A. Marsden and T. Porter.

Company Reports

Coltness Iron Company, Limited.—Interim dividend of 7½d. per share on the ordinary shares of 15s. each.

Qualcast, Limited.—Profit, £44,112; brought in, £28,718; final dividend of 10 per cent. and a bonus of 5 per cent. on the ordinary shares, making a total distribution of 20 per cent. for the year; carried forward, £38,036.

Brightside Foundry & Engineering Company, Limited.—Net profit, £11,979; brought in, £5,491; three years' preference dividends to June 30, 1934, £6,750; dividend of 2½ per cent. on the ordinary shares, £2,500; carried forward, £8,220.

Thos. W. Ward, Limited.—The directors announce payment of a further one year's dividend upon the first preference share capital (thus clearing off the whole of the arrears), and also one and a-half years' dividend upon the tax-free second preference and employees' shares. Warrants will be posted on September 29, and the current quarterly dividend upon the first preference shares will be paid on the same date.

Contracts Open

Lithuania, September 27.—200 tons of hematite, for the Railway Administration. The Department of Overseas Trade. (Reference G.Y. 14,280.)

Sandown (I.W.), October 1.—1,600 yds. of 4-in. spun iron pipes and 560 yds. of 3-in. cast-iron spigot and socket pipes, for the Sandown-Shanklin Urban District Council. The Water Engineer, 76, Fitzroy Street, Sandown, I.W.

London, S.W., September 28.—The Commissioners of Works, etc., invite tenders for supply of brass foundry. The Controller of Supplies, H.M. Office of Works, etc., King Charles Street, Westminster, London, S.W.1.

Patent Specifications Accepted

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

410,539. THOMAS, H. S., and DAVIES, W. R. Machinery for use in connection with the manufacture of tinplates or sheets and other like plates or sheets.

410,898. BAILEY, R. W., ENGLISH STEEL CORPORATION, LIMITED, and ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED. Production of metal castings.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal":—

"ELCARD."—Metal flexible couplings. Eisenwerk Wulfel, c/o Frank Wigglesworth & Company, Limited, Clutch Works, Hirst Wood, Shipley, Yorkshire.

"GEC."—Metal electrical fittings. General Electric Company, Limited, Magnet House, Kingsway, London, W.C.2.

"M.G.7."—Aluminium-magnesium alloys. James Booth & Company (1915), Limited, Argyle Street, Birmingham.

"THORMOS" and "FENICRAL."—Steel alloys. National Steel Foundry (1914), Limited, Kirkland Works, Leven, Fife.

Personal

MR. COLIN D. ABELL has established himself in business as a consulting metallurgist and chemist at 6, Neal Street, Horton Lane, Bradford.

MR. AND MRS. JAMES HODGE LAW, of Furneed Road, Muirkirk, celebrated their diamond wedding anniversary on September 25. Mr. Law, who is 86 years of age, was for over 40 years a steelworker in Lanarkshire.

MR. C. F. GILBERTSON, of Messrs. W. Gilbertson & Company, Limited, Pontardawe, and a director of Messrs. Richard Thomas & Company, Limited, has been elected chairman of the South Wales Siemens Steel Association, in succession to the late Mr. Frank J. Rees. Capt. H. Leighton Davies, J.P., of Messrs. Baldwins, Limited, has been elected vice-chairman of the Association.

MR. J. B. ALLAN, M.A., of the Staveley Coal & Iron Company, Limited, and MR. JAMES SMITH, of Messrs. Smith & Company (South Shields), Limited, President of the National Ironfounding Employers' Federation, who are both members of the Council of the British Cast Iron Research Association, are officially to represent the Association at the forthcoming American Foundrymen's Association Congress at Philadelphia.

Will

HOWE, THOMAS, managing director of Sheffield Hollow Drill Steel Company, Limited	£21,978
FULTON, L. V., of Greenock, chairman of Messrs. P. MacCallum & Sons, Limited, iron and steel merchants, etc.	£368,470

Obituary

MR. ANDREW MCKNIGHT, proprietor of the establishment known as "The Clyde Model Dockyard" in the Argyll Arcade, Glasgow, died in Giffnock, near Glasgow, on September 19. Mr. McKnight took over the model dockyard over 40 years ago from John Galetti, and its fame became world-wide for the making of models of ships and all kinds of engines. Many models were made for the British Admiralty and shipping and engineering companies and designers in the factory in the East End of Glasgow.

THE DEATH OCCURRED in London, on September 20, of Mr. William Hubert Warre Cornish, C.B.E., senior assistant secretary of the Scottish Education Department, at the age of 61. Mr. Warre Cornish was educated at Eton and King's College, Cambridge, and had a brilliant scholastic career. After a short experience as a teacher he entered the Civil Service in 1889, when Sir Henry Craik appointed him to a junior examinership. He served in the Scottish Education Department for 35 years under four permanent secretaries, where he gathered an extensive knowledge of the traditions and history of Scottish education and displayed great sympathy with and understanding of its special problems. Mr. Cornish was a member of the advisory committee of the Institute of British Foundrymen in conjunction with the City and Guilds of London Institute for patternmaking and foundry practice since its inception as representative of the Scottish Education Department.

Forthcoming Events

OCTOBER 2.

Sheffield Metallurgical Association:—"Industrial Efficiency," lecture by Sir William Larke, K.B.E., at 8 p.m., at the Mappin Hall, The University, Applied Science Department.

Institute of British Foundrymen

OCTOBER 3.

London Branch:—"The Dagenham Foundry of the Ford Motor Company, Limited." Paper by V. C. Faulkner and J. N. Burns.

OCTOBER 5.

Wales and Monmouth Branch:—Opening Social and Whist Drive at Cardiff.

OCTOBER 6.

Lancashire Branch:—Presidential address by Mr. W. M. Cook, to be followed by a discussion on "Foundry Problems." Engineers' Club, Albert Square, Manchester, at 4 p.m.

XUM

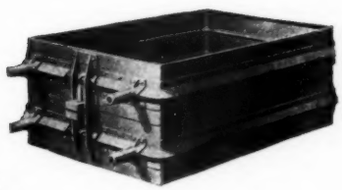
Sterling

UP-TO-DATE MOULDING BOX EQUIPMENT.

STERLING ROLLED STEEL MOULDING BOXES

have been designed for THE MODERN FOUNDRY.

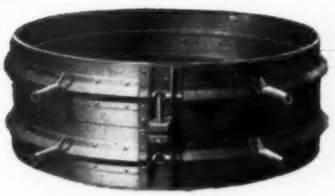
They are light and easy to handle.
Cannot crack or break.
Cannot spring.
Strong, Rigid, Durable and Permanently accurate.



BY ADOPTING STERLING BOXES IN YOUR FOUNDRY,

You will halve your moulding costs. You will increase production per man per hour, and reduce your box maintenance costs. You will turn out more accurate castings and thereby reduce your scrap and reject accounts. You will considerably reduce your fettling costs and put money into your pocket that is now running to waste.

STERLING BOXES save their cost in a few months and are obviously a sound investment for any foundry.



STERLING FOUNDRY SPECIALTIES Ltd.

Agents at :—London, Manchester, Newcastle-on-Tyne and Glasgow.

BEDFORD.

Raw Material Markets

A note of quiet optimism prevails in the home iron and steel trade, business continuing to show a gradual expansion. The demand for pig-iron is quite satisfactory, and it is evident that the consuming trades are keeping up their activity. Current business is not very substantial, but this is accounted for by the fact that many of the larger consumers have contracted well ahead for their future supplies.

Pig-Iron

MIDDLESBROUGH.—The Cleveland foundry-iron trade seems to have reached a state of stability, any further expansion being regarded as improbable for the time being. A steady home demand, coupled with increased shipments to Scotland, is sufficient to absorb the current output. Export trade is very poor, blocked credits in Germany and Italy having further limited the few remaining outlets. The price-fixing agreement does not extend to foreign sales, and it is understood that as low as 60s. per ton f.o.b. has been quoted to overseas buyers. For home business, 67s. 6d. per ton delivered Middlesbrough is still the minimum price of No. 3 Cleveland G.M.B., quotations for other areas being 69s. 6d. per ton delivered North-East Coast, 67s. 3d. delivered Falkirk and 70s. 3d. delivered Glasgow.

New business in East Coast hematite has been limited since the makers announced increased prices in those areas where competition from other producing districts is not at its keenest. The East Coast furnaces can afford to wait, however, as they have well-filled order-books. Delivered prices of No. 1 hematite are as follow:—Middlesbrough, 69s. per ton; North-East Coast, 71s.; Yorkshire, 75s. to 78s.; Birmingham, 79s.; Lancashire, 76s.; Scotland, 76s. The makers still retain freedom of action in Sheffield.

LANCASHIRE.—There is generally a steady demand from this area for foundry iron, but comparatively little forward buying has been transacted. The chief development of the past week has been the move made by the West Coast hematite producers in order to meet East Coast competition in the Lancashire market. The West Coast furnaces have reduced their quotation for delivery in the Manchester district by something like 2s. per ton. East Coast hematite for delivery here remains unchanged in price. Quotations for Derbyshire, Staffordshire and Lancashire brands of No. 3 foundry iron for delivery to Lancashire users are maintained on the basis of 74s. per ton, with Northants at 72s. 6d., Derbyshire forge at 69s. to 70s., and Scottish No. 3 at about 82s. 6d.

MIDLANDS.—Most of the founders having covered their supplies of pig-iron over the next three or six months, there is naturally not a great deal of new business about. Substantial deliveries are being made from the furnaces, especially to the light foundries, who are looking forward to an active winter. Prices have undergone no change. Midland prices, including delivery to Birmingham and Black Country stations are 67s. 6d. per ton for Northants No. 3 and 71s. per ton for Derbyshire, Lincolnshire and North Staffordshire No. 3. As indicated recently, improvement is very possible within the next few weeks in the better grades of iron for the general engineering trades, as there are signs in a number of directions of a re-awakening of interest. Quotations range from 72s. 6d. to 80s. for medium-phosphorus, 85s. to 87s. 6d. for low-phosphorus, in which category Scottish iron is included, and from £5 10s. to £6 15s. for special refined iron. Although there has been an advance in the price of East Coast hematite in some districts of from 1s. to 2s. per ton, no change was made in the Midlands, the controlled price remaining at £3 18s., while West Coast hematite is at £4 4s. 6d. per ton. Welsh hematite is at about 77s. per ton delivered this area.

SCOTLAND.—The number of Scottish blast furnaces in action has been reduced to 13, three on hematite, three on basic and seven on foundry iron. The price of foundry remains at 70s. for No. 3, f.o.t. furnaces, with 2s. 6d. extra for No. 1. Cleveland iron, imports of which have been particularly heavy lately, remains at 67s. 3d. at Falkirk and 70s. 3d. at Glasgow for No. 3 foundry, but there has been an increase of 1s. in the price of East Coast hematite. The new price of 76s. per ton does not offer much chance of business with Scottish hematite at 71s. delivered works.

Coke

Current orders for foundry coke are mostly restricted to a few trucks at a time, as the majority of ironfounders have already covered their requirements over the next three or six months. Present quotations for delivery at Midland stations are as follow:—Best Durham coke, 36s. to 40s.; other grades, down to 34s.; Welsh coke, 37s. 6d. to 45s.; Scottish low-ash coke, 40s. to 41s. per ton.

Steel

Trading in the steel markets has become rather quieter, but this was only to be expected after the burst of activity in the early part of September, states the official report of the London Iron and Steel Exchange. There is a good volume of inquiry in the market, and it is anticipated that the present lull will be only temporary. In the semi-finished steel department, buying has been rather quiet. Many consumers hold considerable stocks, and are showing little interest in the market. Lately, contracts which have expired have been renewed, but, on the whole, trading in this department has been inactive. There has been comparatively little business in Continental material, although sellers compete keenly for orders. A steady business is passing in finished-steel materials, and most of the steelworks are well furnished with orders; but in some departments contracts are being worked off more quickly than new business is being received. The home demand, however, seems to be gradually expanding, while export business has shown some improvement of late.

Scrap

There is an improving demand for scrap iron in the Cleveland area, and sellers have now no difficulty in obtaining 50s. for heavy metal in machinery sizes and 52s. 6d. for good heavy machinery cast iron. There is a steady demand for cast-iron scrap in the Midlands, prices in that area remaining unchanged. In South Wales, heavy cast iron is at 47s. 6d. to 48s. 6d., light metal at 41s. 6d. to 42s. 6d. and heavy cast-iron machinery scrap at 52s. 6d. In Scotland, machinery grade is at 55s., and ordinary heavy metal at 51s. 6d. per ton.

Metals

Copper.—There has been a steadier tone in the copper market, a little more interest having been shown by industrial consumers. General conditions, however, still remain far from satisfactory, and the total volume of business passing is limited.

Further rumours have been circulating, particularly in the United States, that a world conference of copper producers is to be held in New York next month. While an international agreement on copper might be desirable, it is very unlikely that it will come about. America no longer holds such a dominant position in the world copper market as she did. According to the 1933 figures, South America and the British Empire accounted for 41 per cent. of the world copper output, the United States for 38 per cent., and other producers for 21 per cent. The new low-cost mines that have been opened up in South Africa and Canada are gaining an increasing importance in the world copper trade, mainly at the expense of the U.S. companies.

Daily market prices:—

Cash.—Thursday, £27 11s. 3d. to £27 12s. 6d.; Friday, £27 10s. to £27 12s. 6d.; Monday, £27 10s. to £27 11s. 3d.; Tuesday, £27 11s. 3d. to £27 12s. 6d.; Wednesday, £27 8s. 9d. to £27 10s.

Three Months.—Thursday, £27 17s. 6d. to £27 18s. 9d.; Friday, £27 16s. 3d. to £27 17s. 6d.; Monday, £27 15s. to £27 16s. 3d.; Tuesday, £27 17s. 6d. to £27 18s. 9d.; Wednesday, £27 15s. to £27 16s. 3d.

Tin.—A very tight control is being kept on supplies of tin, and the market has therefore been firm. This tendency is likely to be further accentuated, as another cut in production is to come into force at the beginning of next month.

Messrs. Brandeis, Goldschmidt say that "The present price of tin is much too high, while the production is much too small, and this is having a disastrous effect on consumption, and, especially in the United States and in Germany, measures are taken to give every encouragement for this metal to be replaced by substitutes."

Price fluctuations:—

Cash.—Thursday, £230 5s. to £230 10s.; Friday, £230 10s. to £230 15s.; Monday, £231 12s. 6d. to £231 17s. 6d.; Tuesday, £232 10s. to £232 15s.; Wednesday, £232 17s. 6d. to £233.

Three Months.—Thursday, £228 to £228 2s. 6d.; Friday, £227 15s. to £228; Monday, £228 7s. 6d. to £228 12s. 6d.; Tuesday, £229 to £229 5s.; Wednesday, £229 4s. to £229 5s.

Spelter.—There has been a slightly improved inquiry for spelter from consuming works in this country. Unfortunately, the shortage of duty-free Empire metal still persists, and some works with urgent requirements have had to buy foreign metal from bonded warehouse, paying the requisite duty. Needless to say, this was not the position intended when the Empire producers were first granted the preference.

Day-to-day quotations:—

Ordinary.—Thursday, £12 10s.; Friday, £12 10s.; Monday, £12 7s. 6d.; Tuesday, £12 7s. 6d.; Wednesday, £12 10s.

Lead.—A fair amount of interest has been displayed in this metal, in consequence of the low prices prevailing. Up to now, however, any buying that has taken place has been confined to the metal merchants, generally speaking.

Price fluctuations have been as follow:—

Soft Foreign (Prompt).—Thursday, £10 10s.; Friday, £10 10s.; Monday, £10 12s. 6d.; Tuesday, £10 11s. 3d.; Wednesday, £10 12s. 6d.

Indian Tariff Changes

NEW IRON AND STEEL DUTIES

On August 27 last, the Bill for the Iron and Steel Duties Act, 1934, as amended by the Select Committee, was passed by the Indian Legislative Assembly. The approved Bill, which is based on the recommendations in the Report of the Indian Tariff Board on the Iron and Steel Industry, introduces certain changes in the current Customs duties on iron and steel products, such changes coming into force on November 1 next. The new duties include an excise duty which has been fixed at Rs. 4 per ton. The following items are taken from the list of those which are to be substituted for the corresponding items in the Schedule to the Indian Tariff Act, 1894, and shows the new duties. It should be noted that some changes have been made in the specification of certain items.

146A—CAST-IRON PIPES and TUBES: also cast-iron fittings therefor, that is to say, bends, boots, elbows, tees, sockets, flanges, plugs, valves, cocks and the like, (i) of British manufacture: 10 per cent. *ad valorem*. (ii) Not of British manufacture: Rs. 57-8-0 per ton.

149A—IRON or STEEL, the original material (but not including machinery) of any ship or other vessel intended for inland or harbour navigation which has been assembled abroad, taken to pieces and shipped for re-assembly in India, (i) of British manufacture: 1½ times the excise duty leviable for the time being on steel ingots produced in British India; or 10 per cent. *ad valorem*, whichever is higher; (ii) not of British manufacture: 1½ times the excise duty leviable for the time being on steel ingots produced in British India, *plus* Rs. 27-8-0 per ton, or 20 per cent. *ad valorem*, whichever is higher. Provided that articles dutiable under this item shall not be deemed to be dutiable under any other item.

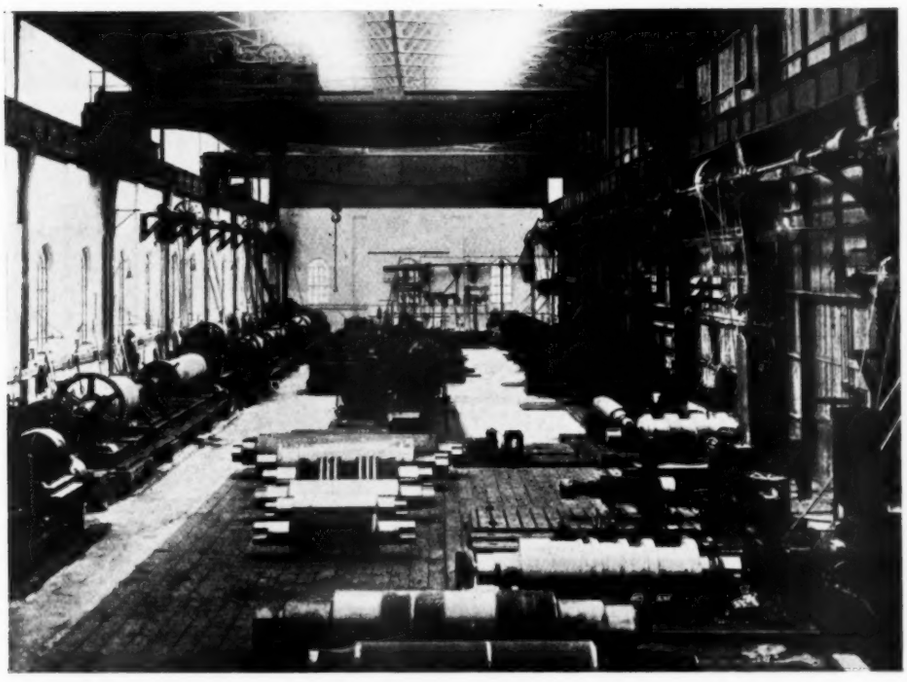
235—IRON ALLOYS, viz., ferro-manganese, ferro-silicon, ferro-chrome, spiegeleisen and the like as commonly used for steel making. Iron, pig. Iron rice bowls: *Ad valorem:* Standard rate, 20 per cent.; United Kingdom rate, 10 per cent.

MESSRS. EVERITT & COMPANY, LIMITED, are removing their office from 31, Walbrook, London, E.C.4, to Brettenham House, 5 and 6, Lancaster Place, Strand, London, W.C.2 (telephone: Temple Bar 0077—two lines), as and from Saturday, September 29.

CLONES (COUNTY MONAGHAN) URBAN COUNCIL decided, after a lengthy debate, to order steel instead of wooden poles in connection with the installation of electric light in the town. The Council had been offered oak poles for nothing, but it was the opinion of the meeting that, although the provision of steel poles would mean an expenditure equal to 2½d. per £ on the rates, the ultimate result would be more satisfactory.

XUM

BRITISH ROLL FOUNDRIES



Roll Turning Shop of R. B. TENNENT, LIMITED, COATBRIDGE, regular users of

GENUINE
COLD BLAST PIG IRON

The continued use of Genuine Cold Blast Pig Iron, despite modern innovations, is a certain proof that it possesses properties not to be found to the same high degree in any other Pig Iron. This superiority lies chiefly in its remarkable homogeneity, greater strength and better wearing qualities, which are not lost on remelting in the cupola or air furnace, but persist right through to the castings made.

THE EARL OF DUDLEY'S ROUND OAK WORKS, LTD.
BRIERLEY HILL, STAFFS.
Brand: "DUD·L.N.F'ces·DUD"

M. & W. GRAZEBROOK, LIMITED
DUDLEY, WORCS.
Brand: "GRAZEBROOK"

THE LOW MOOR IRON CO., LTD.,
NEW WORKS, LOW MOOR, BRADFORD - YORKSHIRE
Brand: "LOWMOOR C.B."

XUM

RAW MATERIALS—PRICE LIST

(Wednesday, September 26, 1934)

COPPER

	£	s.	d.
Standard cash	27	8	9
Three months	27	16	3
Electrolytic	30	10	0
Tough	29	15	0
Best selected	30	5	0
Sheets	58	0	0
India	40	10	0
Wire bars	30	17	6
Ingot bars	30	17	6
H.C. wire rods	33	7	6
Off. av. cash, August	28	7	10 1/11
Do., 3 mths., August	28	15	1 3/11
Do., Sttlmnt., August	28	7	10 1/11
Do., Electro, August	31	14	1 17/22
Do., B.S., August	31	9	8 3/11
Do., wire bars, August	31	18	7 7/11
Solid drawn tubes			9½d.
Brazed tubes			9½d.
Wire			6¼d.

BRASS

Solid drawn tubes	8¾d.
Brazed tubes	10½d.
Rods, drawn	8¾d.
Rods, extd. or rlld.	4¼d.
Sheets to 10 w.g.	7d.
Wire	7¾d.
Rolled metal	6¼d.
Yellow metal rods	4¼d.
Do. 4 × 4 Squares	5¾d.
Do. 4 × 3 Sheets	5¾d.

TIN

	£	s.	d.
Standard cash	232	17	6
Three months	229	0	0
English	233	0	0
Bars	234	15	0
Straits	233	0	0
Australian (nom.)			—
Eastern	230	10	0
Banca	233	10	0
Off. av. cash, August	228	4	1 7/22
Do., 3 mths., August	228	1	5 3/11
Do., Sttlmt., August	228	5	8 3/11

SPELTER

	£	s.	d.
Ordinary	12	10	0
Remelted	13	5	0
Hard	10	7	6
Electro 99.9	15	2	6
English	13	12	6
India	12	7	6
Zinc dust	17	0	0
Zinc ashes	3	0	0
Off. aver., August	13	14	4½
Aver. spot, August	13	13	7 7/11

LEAD

	£	s.	d.
Soft foreign ppt.	10	12	6
Empire (nom.)	11	6	3
English	12	10	0
Off. average, August	10	18	5 1/44
Average spot, August	10	16	5 1/22

ALUMINIUM

Ingots	£100 to £105
Wire	1/1 to 1/9 lb.
Sheet and foil	1/2 to 2/9 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	23	10	0
Do., V.M. ex whse.	22	15	0
Rods	27	0	0

ANTIMONY

	£	s.	d.
English	43 0 0 to 45	0	0
Chinese, ex-whse.	37	0	0
Crude	—		

QUICKSILVER

	£	s.	d.	£	s.	d.
Quicksilver	11	2	6 to	11	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS

Ferro-silicon—	
25%	£8 17 6
45/50%	£13 0 0
75%	£18 17 6
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free	5/6 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£14 10 0
Ferro-tungsten—	
80/85%	3/- lb.
Tungsten metal powder—	
98/99%	3/3 lb.
Ferro-chrome—	
2/4% car.	£29 15 0
4/6% car.	£23 0 0
6/8% car.	£21 12 6
8/10% car.	£21 12 6
Ferro-chrome—	
Max. 2% car.	£36 0 0
Max. 1% car.	£38 15 0
Max. 0.70% car.	£42 0 0
70% carbon-free	10d. lb.
Nickel—99.5/100%	£200 to £205
"F" nickel shot	£184 0 0
Ferro-cobalt, 98/99%	5/3 lb.
Metallic chromium—	
96/98%	2/5 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to £11 5 0
76/80% packed	£11 15 0 to £12 5 0
76/80% export	(nom.) £9 15 0
Metallic manganese—	
94/96% carbon-free	1/2 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 1/16 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ¼ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

	£	s.	d.	£	s.	d.
South Wales—						
Heavy steel				2	15	0
Bundled shrngs.				2	7	6
Mixed iron and steel	2	10	0 to	2	11	0
Heavy cast iron	2	7	6 to	2	8	6
Good machinery				2	12	6
Cleveland—						
Heavy steel				2	10	0
Steel turnings				1	15	0
Cast-iron borings				1	5	0
Heavy forge				2	10	0
W.I. piling scrap				2	5	0
Cast-iron scrap	2	10	0 to	2	12	6
Midlands—						
Light cast-iron scrap				2	7	6
Heavy wrought iron				2	17	6
Steel turnings, f.o.r.				1	13	0
Scotland—						
Heavy steel	2	10	0 to	2	12	6
Ordinary cast iron				2	11	6
Engineers' turnings				1	19	6
Cast-iron borings	1	17	6 to	2	0	0
Wrought-iron piling				2	11	3
Heavy machinery	2	13	6 to	2	15	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.	£	s.	d.
Copper (clean)				25	0	0
Brass				16	10	0
Lead (less usual draft)				9	10	0
Tea lead				7	0	0
Zinc				9	0	0
New aluminium cuttings				66	0	0
Braziery copper				22	0	0
Gunmetal				22	0	0
Hollow pewter				145	0	0
Shaped black pewter				110	0	0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	70/-
Foundry No. 3	67/6
,, at Falkirk	67/3
,, at Glasgow	70/3
Foundry No. 4	66/6
Forge No. 4	66/6
Hematite No. 1	69/-
Hematite M/Nos.	68/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	72/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	67/-
,, No. 3 fdry.	71/-
Northants forge	63/6
,, fdry. No. 3	67/6
,, fdry. No. 1	70/6
Derbyshire forge	67/-
,, fdry. No. 3	71/-
,, fdry. No. 1	74/-
Scotland—	
Foundry No. 1, f.o.t.	72/6
,, No. 3, f.o.t.	70/-
Hem. M/Nos. d d	71/-
Sheffield (d/d district)—	
Derby forge	64/6
,, fdry. No. 3	68/6
Lincs forge	64/6
,, fdry. No. 3	68/6
E.C. hematite	81/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	74/-
Staffs fdry. No. 3	74/-
Northants fdry. No. 3	72/6
Cleveland fdry. No. 3	74/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	82/6
Clyde, No. 3	82/6
Monkland, No. 3	82/6
Summerlee, No. 3	82/6
Eglinton, No. 3	82/6
Gartsherrie, No. 3	82/6
Shotts, No. 3	82/6

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	9	12	6 to	9	15	0
Nut and bolt iron	7	10	0 to	8	0	0
Hoops	10	10	0 and up.			
Marked bars (Staffs) f.o.t.				12	0	0
Gas strip	10	10	0 and up.			
Bolts and nuts, ¾ in. × 4 in.				14	0	0
Steel—						
Plates, ship, etc.	8	15	0 to	8	17	6
Boiler plts.	8	0	0 to	8	10	0
Chequer plts.				10	7	6
Angles				8	7	6
Tees				9	7	6
Joists				8	15	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ⅜ in. (Untested)				8	12	0
Flats—8 in. wide and over				8	12	6
,, under 8 in. and over 5 in.				8	17	6
Rails, heavy	8	5	0 to	8	10	0
Fishplates	12	5	0 to	12	10	0
Hoops (Staffs)				9	7	0
Black sheets, 24g. (4-t. lots)				10	10	0
Galv. cor. shts. (,,)				13	0	0
Galv. flat shts. (,,)				13	10	0
Galv. fencing wire, 8g. plain				14	10	0
Billets, soft	5	10	0 and up.			
Billets, hard	6	17	6 to	7	2	6
Sheet bars	5	2	6 to	5	10	0
Tin bars	5	2	6 to	5	7	6

PHOSPHOR BRONZE

	Per lb. basis.
Strip	9d.
Sheet to 10 w.g.	10d.
Wire	11¼d.
Rods	10d.
Tubes	13d.
Castings	11d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	20.26
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic, Valley	18.00
Bessemer	20.76
Malleable, Valley	18.50
Grey forge, Valley	18.25
Ferro-mang. 80%, seaboard	85.00
O.-h. rails, h'y, at mill	36.37½
Billets	27.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.80
Steel bars	1.80
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.70
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.60
Plain wire	2.30
Barbed wire, galv.	3.00
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/- to 30/-
,, furnace	19/- to 20/-
Durham foundry	20/- to 25/-
,, furnace	17/6
Midlands, foundry	—
,, furnace	—

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box		18/2
,,	28×20 ,,		36/4
,,	20×10 ,,		26/- to 26/1½
,,	18¾×14 ,,		18/7½ to 18/9
C.W.	20×14 ,,		15/7½
,,	28×20 ,,		33/6 to 33/9
,,	20×10 ,,		22/9 to 23/-
,,	18¾×14 ,,		16/-

SWEDISH CHARCOAL IRON & STEEL

	£	s.	d.	£	s.	d.
Pig-iron	6	0	0 to	7	0	0
Bars-hammered, basis	16	0	0 to	16	10	0
Bars and nail-rods, rolled, basis	15	15	0 to	16	0	0
Blooms	10	0	0 to	12	0	0
Keg steel	30	0	0 to	31	0	0
Faggot steel	18	0	0 to	23	0	0
Bars and rods dead soft, st'l	10	0	0 to	12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

		£ s. d.	
Sept. 20 ..	27 11 3	inc.	1/3
,, 21 ..	27 10 0	dec.	1/3
,, 24 ..	27 10 0	No change	
,, 25 ..	27 11 3	inc.	1/3
,, 26 ..	27 8 9	dec.	2/6

Electrolytic Copper

		£ s. d.	
Sept. 20 ..	30 10 0	inc.	2/6
,, 21 ..	30 10 0	No change	
,, 24 ..	30 10 0	,,	,,
,, 25 ..	30 10 0	,,	,,
,, 26 ..	30 10 0	,,	,,

Standard Tin (cash)

	£ s. d.		
Sept. 20 ..	230 5 0	inc.	30/-
,, 21 ..	230 10 0	,,	5/-
,, 24 ..	231 12 6	,,	22/6
,, 25 ..	232 10 0	,,	17/6
,, 26 ..	232 17 6	,,	7/6

Tin (English ingots)

	£ s. d.		
Sept. 20 ..	230 5 0	inc.	30/-
,, 21 ..	230 15 0	,,	10/-
,, 24 ..	231 15 0	,,	20/-
,, 25 ..	232 10 0	,,	15/-
,, 26 ..	233 0 0	,,	10/-

Spelter (ordinary)

	£ s. d.		
Sept. 20 ..	12 10 0	inc.	2/6
,, 21 ..	12 10 0	No change	
,, 24 ..	12 7 6	dec.	2/6
,, 25 ..	12 7 6	No change	
,, 26 ..	12 10 0	inc.	2/6

Spelter (Electro, 99.9 per cent.)

	£ s. d.		
Sept. 20 ..	15 2 6	inc.	2/6
,, 21 ..	15 2 6	No change	
,, 24 ..	15 0 0	dec.	2/6
,, 25 ..	15 0 0	No change	
,, 26 ..	15 2 6	inc.	2/6

Zinc Sheets (English)

	£ s. d.	
Sept. 20 ..	23 10 0	No change
,, 21 ..	23 10 0	,, ,,
,, 24 ..	23 10 0	,, ,,
,, 25 ..	23 10 0	,, ,,
,, 26 ..	23 10 0	,, ,,

Lead (English)

	£ s. d.	
Sept. 20 ..	12 10 0	No change
,, 21 ..	12 10 0	,, ,,
,, 24 ..	12 10 0	,, ,,
,, 25 ..	12 10 0	,, ,,
,, 26 ..	12 10 0	,, ,,

AVERAGE MONTHLY PRICES OF DERBYSHIRE NO. 3 FOUNDRY AT MANCHESTER.

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1898	2 7 6	2 8 0	2 8 0	2 8 0	2 8 6	2 10 0	2 10 0	2 10 0	2 10 0	2 11 0	2 14 0	2 14 0	2 9 11
1899	2 13 0	2 14 0	2 14 0	2 14 0	3 0 0	3 2 0	3 13 0	3 16 6	3 15 0	3 16 6	3 16 6	4 0 0	3 6 2½
1900	4 0 0	4 0 0	4 0 0	4 1 6	4 1 0	3 18 0	3 13 6	3 12 6	3 11 0	3 11 0	3 9 6	3 8 0	3 15 5
1901	2 13 6	2 17 0	2 15 0	2 15 0	2 14 0	2 13 9	2 13 6	2 13 6	2 14 6	2 13 0	2 12 6	2 16 6	2 14 3½
1902	2 17 6	2 17 6	2 15 6	2 16 9	2 16 6	2 16 6	2 16 6	2 17 0	2 18 6	2 18 6	2 17 6	2 17 6	2 17 1½
1903	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6
1904	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6	2 17 6
1905	2 13 0	2 13 0	2 11 6	2 12 6	2 12 0	2 12 0	2 12 3	2 12 3	2 14 0	2 16 6	3 0 0	3 0 6	2 14 1
1906	3 2 0	3 5 0	3 3 0	3 0 6	2 17 0	2 18 6	2 18 0	2 16 6	2 19 0	3 0 6	3 1 6	3 7 0	3 0 8½
1907	3 7 0	3 7 0	3 5 0	3 2 0	3 4 0	3 8 0	3 6 0	3 5 0	3 4 0	3 2 6	3 1 0	2 18 6	3 4 2
1908	2 15 0	2 14 6	2 14 6	2 15 6	2 14 0	2 13 0	2 13 0	2 11 6	2 12 6	2 13 0	2 12	2 12 6	2 13 5½
1909	2 13 0	2 12 6	2 11 6	2 12 0	2 12 6	2 12 6	2 12 0	2 12 6	2 14 6	2 15 0	2 14 6	2 14 0	2 13 0½
1910	2 13 9	2 14 0	2 14 0	2 14 4	2 15 0	2 15 0	2 14 9	2 15 0	2 15 0	2 15 0	2 15 0	2 15 0	2 14 7½
1911	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 16 0	2 14 6	2 15 0	2 15 0	2 15 8½
1912	2 17 4½	2 17 6	2 17 6	3 1 1½	3 2 6	3 3 9	3 6 3	3 7 6	3 10 10½	3 12 6	3 13 3½	3 14 6	3 5 4
1913	3 15 7	3 15 0	3 11 10½	3 11 4½	3 10 2½	3 6 10½	3 4 2½	3 2 9	3 1 9	3 1 0	2 19 3	2 17 2½	3 6 5
1914	2 17 2½	2 18 0	2 18 0	2 17 0	2 17 0	2 16 7½	2 16 0	3 2 10	3 1 0	2 19 9½	2 16 11½	2 18 1½	2 18 2
1915	3 1 2	3 3 11	3 5 9	3 18 8½	3 13 7	3 14 1	3 15 0	3 13 3	3 12 0½	3 11 1	3 14 0	4 3 3	3 12 2½
1916	4 4 6½	4 11 6	4 11 6½	4 7 6	4 7 6	4 7 6	4 10 0	4 12 10	4 12 6	4 12 6	4 12 6	4 12 6	4 8 6½
1917	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6
1918	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6	4 12 6
1919	4 12 6	4 12 6	4 12 6	4 12 6	7 2 6	7 5 0	8 8 5	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	7 3 10
1920	9 13 9	10 0 0	10 5 3	10 15 3	11 10 0	12 2 6	12 5 0	13 1 3	14 7 6	14 5 0	14 5 0	14 5 0	12 12 1½
1921	12 11 8	10 8 9	9 2 6	8 2 0	8 0 0	8 0 0	8 0 0	8 1 8	7 4 0	6 7 6	5 7 6	4 14 10	8 0 2
1922	5 5 0	4 17 6	4 15 0	4 15 0	4 12 6	4 12 6	4 12 6	4 12 6	4 11 3	4 10 0	4 10 0	4 16 0	4 13 7½
1923	4 12 8½	5 0 2	6 2 6	6 8 7½	6 2 5	5 11 9	5 9 1½	5 4 0	5 0 0	5 0 9	5 0 7	5 2 9	5 7 11½
1924	5 3 0	5 3 0	5 3 0	5 3 0	5 2 10	5 1 3	4 17 11	4 15 6	4 13 6	4 10 1½	4 10 3	4 10 3	4 17 9½
1925	4 13 0	4 9 0	4 6 9	4 5 2½	4 3 0	4 0 1½	4 17 1½	3 15 7½	3 14 3½	3 13 4½	3 13 4½	3 13 2½	4 1 9
1926	3 14 9	3 15 3	3 15 6	3 15 3½	3 17 6	4 5 9	4 16 9	*	*	*	*	4 12 6	4 0 1½
1927	4 13 9½	4 13 3	4 11 1½	4 9 4½	4 6 1½	3 19 1½	3 16 1½	3 15 6	3 13 4½	3 13 4½	3 14 0	3 13 6½	4 1 6½
1928	3 13 2½	3 12 3½	3 12 3	3 11 6	3 10 0	3 8 3	3 7 8½	3 7 6	3 15 1½	3 17 0	3 17 0	3 17 0	3 9 10½
1929	3 8 3½	3 10 4½	3 10 10½	3 11 0	3 11 2½	3 12 0	3 12 4½	3 14 6	3 12 0	3 12 0	3 10 1½	3 9 6	3 13 1½
1930	3 17 0	3 17 0	3 17 0	3 17 0	3 17 0	3 17 0	3 15 0	3 12 0	3 12 0	3 7 0	3 7 0	3 7 0	3 14 4½
1931	3 9 6	3 9 6	3 9 6	3 9 6	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 10
1932	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0
1933	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0	3 7 0
1934	3 7 0	3 9 6	3 13 2½	3 14 0	3 14 0	3 14 0	3 14 0	3 14 0	3 14 0	—	—	—	—

* No prices available during strike period.

WILLIAM JACKS & COMPANY,
WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

CLARENCE CHAMBERS, 39, CORPORATION STREET, BIRMINGHAM.
13, RUMFORD STREET, LIVERPOOL.

PIG IRON

REGISTERED TRADE MARK
LIMPET

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,
CENTRAL CHAMBERS, 93, HOPE ST., GLASGOW, C.2.
ZETLAND ROAD, MIDDLESBROUGH.

Notice

Small Advertisements in this section of the Journal are accepted at the prepaid rate of 6d. per line, first line in capitals counting two, average 6 words per line. Minimum charge for one insertion 3/-

(A remittance should accompany instructions.)

SITUATIONS VACANT AND WANTED

BRASS-FOUNDRY Foreman seeks engagement; experienced in Admiralty contracts; gunmetal, phos.-bronze; last position 12 years.—Box 892, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY MANAGER, or Foreman, desires position; experienced all classes engineering work, iron, iron alloys, stainless steel, and all non-ferrous metals; can guarantee results.—Box 872, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PATTERNMAKER, exceptional ability, moulding shop, drawing and estimating office experience, seeks position as Foreman. Sound technical knowledge modern methods. Educated and keen.—Apply, Box 906, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOREMAN, to take charge of small casting foundry (up to 28 lbs. weight) employing 150 people. Good salary offered to right man.—Apply in writing, giving full particulars of age, qualifications, salary required, etc., to Box 902, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY Foreman required for Locomotive Cylinder work; give full particulars of experience.—Box 884, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

REPRESENTATIVE wanted for Scotland, to call on steel foundries with new product; must have good connection and be trustworthy; splendid opportunity for right man.—State connections and full particulars to Box 904, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

EMPLOYMENT REGISTER.

Conducted by the Institute of British Foundrymen by courtesy of the proprietors of THE FOUNDRY TRADE JOURNAL.

Correspondence should be addressed to the General Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, from whom full particulars can be obtained of this service.

Any employer wishing to communicate with a candidate should write to the General Secretary, quoting identification number.

METALLURGIST (malleable or grey-iron foundry) requires position. Expert in refining irons to special analysis. Would act as Chief Chemist and take charge of melting, heat-treatments, and assist manager. Executive and research experience. (250)

FOUNDRY Foreman requires position. Excellent experience with high-class work, including repetition work and moulding machines. Metal-mixing. Accustomed to modern foundry plant, estimating and costing. (251)

AGENCIES

CANISTER AGENCY offered to Traveller already regularly calling on foundries.—Box 882, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

AGENCIES—*Continued.*

PARTING Powder, Blackings, Plumbagos. Old-established firm require live Agents or Merchants with sound connection in most industrial areas. Favourable terms.—Write, Box 908, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

MACHINERY

SAND SLINGER, portable type, in good condition, for sale cheaply owing to reorganisation of foundry. Machine is warranted in perfect order.—Box 896, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WANTED, No. 2 size Pneulec-Royer Sand-mixing Machine, preferably suitable for 110 volts D.C.; also Model D Double-ended Norton Floor Grinding Machine, to take 16-in. x 3-in. wheels; must be Norton make to match existing machines, and both above must be in first-class working condition.—Offers with full particulars and where, if necessary, machines can be inspected, to NEWMAN, HENDER & COMPANY, LIMITED, Woodchester, Glos.

NEW Dwarf Cupola, to melt 10 to 15 cwts. per hr. New Worm-geared Ladles, 5 tons, 25 cwts., 15 cwts. and 10 cwts. capacity. Ungeared Ladles, 15 cwts. and 10 cwts. capacity. Improved Cupola Spark Arresters.—T. DAVIES & SON, West Gorton, Manchester.

FOR Sale, two ER.3 Type Universal Roll-over Moulding Machines, Hydraulic Squeeze, in new condition; surplus to requirements; can be seen in operation. What offers?—Box 900, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

JACKMAN No. 4 Cupola, capacity 6/7 tons. £75. Geared Ladle, 8 tons, £25. Geared Ladle, 7 tons, £15. All in good condition.—Apply, E. HIND, LIMITED, South Bank-on-Tees.

SANDBLAST PLANTS

Room Plants, sizes 12 ft. x 12 ft., 12 ft. x 9 ft. and 6 ft. x 6 ft., made up in cast-iron sections.

Barrel Plants, 30 in. dia. x 36 in. long and 30 in. dia. x 18 in. long rotary barrels.

Cabinet Plants, in sizes 4 ft. x 4 ft. x 4 ft., 36-in. dia. and 30-in. dia. operators' cabinets.

Most of the above by Tilghman and complete with Air Compressors.

HAND MOULDING MACHINES

By Adaptable, Fridmore, Darling & Sellars, etc.; Squeezers by Utard (unused), Samuelson and Britannia, also Farwell Universal Type.

Ladles, Grinding Machines, Exhaust Fans, Blowers, Air Compressors and 500 Electric Motors and Dynamos.

S. C. BILSBY, A.M.I.C.E., A.M.I.E.E.

CROSSWELLS ROAD (Adjoining Railway Crossing), LANGLEY, Nr. Birmingham.

'Phone: Broadwell 1359.

THOS. W. WARD LTD.

Moulding Machines, Steel Ladles, Rumblers, Barrels, etc.

Motor-dr. BLOWER (Keith Blackman), 11½"-dia. outlet, 30-h.p. motor, 440 volts A.C.; 5,000 cub. ft. p.m. at 12" w.g.

VERT. COCHRAN BOILER, 11' 3" x 5', 100 lbs. w.p.

3 LANCS. BOILERS, 30' x 8', 140 lbs. w.p.

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Complete Plant comprising the following:—
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3 Sand-blast Rooms, 6 ft. x 6 ft. x 8 ft. 3 in. high
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Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

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The Chairman,
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(Founded 1838)
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